THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

VOL. XI. No. 243—14th YEAR.] LONDON, FEBRUARY 11, 1862. [Subscription per Ann. 15s. in Advance 18s Credit.] DOUBLE No. Price 1s.

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Full particulars will be forwarded on application to the SECRETARY to the Gas Company, Thornbury, GLOUCESTERSHIRE.

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MR. W. H. BENNETT, having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their invention may be secured for Six Months; or LETTERS PATENT, which are granted for Fourteen Years.

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MAKERS—J. BATTRAY AND CO.,
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These Boilers are supplied to the chief Gas Companies in Britain and on the Continent.

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IRON ROOF, GASHOLDER, AND GAS APPARATUS MANUFACTURERS,
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LESLIE'S PATENTS: Gas and Coke from common Coal, greatly increased in value.—60, Conduit Street, LONDON, W.

LESLIE'S PATENTS: Up to Forty Candle Gas.—60, Conduit Street, LONDON, W.

LESLIE'S PATENTS: Licenses for England, Scotland, and Ireland, the 86 Departments of France and Belgium.—60, Conduit Street, LONDON, W.

LESLIE'S PATENTS: The National Waste Heaps at Collieries UTILIZED for Gas purposes.—60, Conduit Street, LONDON, W.

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MANUFACTURER OF METER FITTINGS,
No. 25, WOOD STREET, LIVERPOOL,

Begs to inform Gas Engineers, Meter Manufacturers and the Trade generally, that he has invented a WATER-LINE REGULATOR, to adjust the Gas-Meter to an exact registration. He has also improved upon the Float and Valve, so that, in a short space of time, a Tester can make the Gas-Meter work in accordance with Lord Redesdale's Act.

The invention is of simple, but correct principles, and obviates the difficulties caused by the restrictions of the Gas Act.

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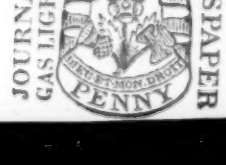
Beg to draw the attention of Engineers and Managers of Gas Works to the superior quality of the Article they manufacture, both in respect of the iron employed, and the perfect manner in which it is welded; in proof of which they can refer to the testimonials of the most eminent Gas Engineers, and the experience of the principal of the large Gas Companies of the Kingdom.

Orders promptly executed.



THREE
MEDALS AWARDED TO
THOMAS GLOVER'S
PATENT DRY GAS-METERS.

LORD REDESDALE'S "SALE OF GAS ACT."

DRY METERS *VERSUS* WET METERS.

LONDON, February 25, 1861.

THOMAS GLOVER begs to call the attention of Gas Companies and others to a few *facts*, which, if duly considered, must lead to most important conclusions :—

1. That since THOMAS GLOVER commenced to manufacture his Patent Dry Gas-Meters (which is now upwards of 15 years), every Wet Meter Maker of any importance in England has been compelled to manufacture Dry Gas-Meters; and in the JOURNAL OF GAS LIGHTING, of date of 12th of February, 1861, Messrs. William Parkinson and Co., successors to the late Samuel Crossley, advertise that they "intend manufacturing *Dry* as well as" Wet Meters, and it is worthy of particular notice that they intend to do so "after 40 years experience in manufacturing Wet Gas-Meters of such a quality that has enabled them, as they say, to maintain a superiority over all other; and this, be it also particularly noticed, after they had advertised in the JOURNAL OF GAS LIGHTING, January 29, 1861, "their improved low-spouted Gas-Meter with new patent float arrangement, which entirely overcomes the difficulty experienced by ordinary Wet Meter."

2. That it is quite consistent with THOMAS GLOVER's knowledge that Wet Gas-Meters, called "low-spouted" or "compensating Wet Meters," have already been proved to be incapable of continuous working or registration, and for this reason the manufacturers of these Meters have been induced to seek the repeal of Lord Redesdale's (righteous) Sale of Gas Act.

3. That every year the Patent Dry Gas-Meter manufactured by THOMAS GLOVER has risen in favour with Gas Companies and Gas Consumers, placing him in the proud position of being the largest manufacturer of Gas-Meters in the country.

THOMAS GLOVER guarantees his Patent Dry Gas-Meters to meet all the requirements of the "Sale of Gas Act," to give accurate and unvarying registration with steady lights; and, from their peculiar construction, cannot be tampered with, and may be fixed in open situations even above or below the level of the lights. They work with less pressure than Wet Meters, and are not affected by the most severe frost.

THOMAS GLOVER guarantees to uphold all Meters sold by him for 5 years free of expense to the purchaser, or for a trifling per centage per annum will contract with any Gas Company to uphold their Meters of his manufacture for a series of years; and, at the conclusion of such contract, to leave the Meters all in perfect working order.

N. B.—Agents in several parts of England are wanted. Apply by letter, or personally.

WILLIAM PARKINSON AND CO.

(SUCCESSORS TO SAMUEL CROSLEY),

PATENT WET AND DRY GAS-METER MANUFACTURERS, &c.

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Established 1816.

PATENT IMPROVED WET METER.

W. P. and Co. invite especial attention to this Meter, which entirely overcomes the difficulty to which ordinary Wet Meters are subjected, owing to the short range of the Float, which is necessary, in order to meet the requirements of the Sale of Gas Act.

"It is well known that in Meters constructed so that the valve will close when the water is drawn off to such a point as to render them 3 per cent. slow the lights are liable to be extinguished by the closing of the valve by a sudden increase of pressure. To meet this difficulty, Mr. Pinchbeck has invented an ingenious and simple arrangement by which the action is reversed, and any such increase of pressure, in his Meter, raises the value instead of depressing it. The fact of the improvement having been adopted by Messrs. W. Parkinson and Co. is a sufficient guarantee that it practically and effectually remedies the inconvenience it is designed to meet."—JOURNAL OF GAS LIGHTING.

PATENT IMPROVED DRY METER,

Which W. P. and Co. pledge themselves to manufacture with the same quality of materials and workmanship as in their Wet Meter, thereby giving Gas Companies and others the advantage of procuring a first-rate Dry as well as a Wet Meter, which, hitherto, they have been unable to do.

STATION-METERS AND GOVERNORS,

Which can be seen at all the London Gas-Works. Also Liverpool, Manchester, Sheffield, Nottingham, Belfast, Glasgow, Birmingham, Dublin, Bristol, Leeds, Leicester, Brighton, Southampton, Sunderland, Wolverhampton, Bradford, Norwich, &c., &c.

TEST GASHOLDERS, EXPERIMENTAL METERS, EXHAUSTER REGULATORS,

MINUTE CLOCKS, PRESSURE GAUGES, PHOTOMETERS, PRESSURE REGISTERS, &c.

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TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

T. L., Strabane.—*The cause of the irregular action of a gas-meter can only be ascertained by examining it carefully. A hole in the drum of a wet meter, or in the diaphragm of a dry one, will explain the variations you mention.*

NOTICES.

The subscription is 15s. per annum, if paid in advance during the month of January, or 18s. credit, in two sums of 9s. each, in July and January of each year. Post-Office orders must be made payable at the Charing-Cross Money-Order Office, to William H. Bennett, No. 42, Parliament Street, Westminster.

The next number will be published on Tuesday, February 25, and the subsequent numbers on each successive alternate Tuesday.

Stamped copies, when forwarded by post, must be folded so as to expose the stamp; they are otherwise liable to the full postage charge for letters.

This JOURNAL has been duly registered at the General Post Office for transmission abroad.

All Communications to be addressed to the Editor, No. 42, Parliament Street, Westminster; and orders for Advertisements to the Publisher, Mr. W. B. King, No. 11, Bolt Court, Fleet Street.

THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, FEBRUARY 11, 1862.

Notes upon Passing Events.

MR. WILLIAM CHAMBERS delivered a lecture in Edinburgh, the other day, on land and building societies, which contains a good deal of interesting information on the investments, and especially the housing, of working men. Building societies began, forty years ago, in Scotland, spread to England, and became the subject of a Statute, 6 and 7 William IV., cap. 32; but they first assumed a solid position when freehold land societies were established, about sixteen years ago. The original object of these societies was to confer on their subscribers forty-shilling freehold votes; that political idea has now become quite a secondary consideration. The two kinds of societies—land and building—act in unison, and combine to afford men of small incomes the means of purchasing land and houses by instalments. Birmingham has been the scene of the greatest success, chiefly in consequence of the influence of one energetic man, and partly because the habits and pursuits of the Birmingham workmen make a separate residence a matter of importance to him. In Birmingham, there are now from 8000 to 9000 houses, with gardens, either already paid for, or in course of being paid for, by subscribers to building societies. "Fully 90 per cent. of the members of the Birmingham societies are mechanics, whose wages average from 24s. to 30s. weekly, out of which the annual average investment of each person is about £18. One group of societies, with 6000 members, receive in the aggregate £100,000 per annum; and another group, with from 3500 to 4000 members, receive in the aggregate not less than £50,000—total, £150,000. The houses are of brick, but neat and attractive, and are provided with gardens and all proper conveniences. The greater number of these dwellings are situated in the environs, on land bought for the purpose." Mr. Chambers, in describing his visits to some of these cottages, said that he found that workmen with from 20s. to 30s. a week have been able to become proprietors of very neat, comfortable dwellings. Flitches of bacon hung from the ceilings; books and framed prints were not wanting. One cottage was that of an artisan who contributed 13s. a fortnight, in instalments, towards the price of his home, and was assisted by his wife, who, last year, realized £3 from a crop of potatoes of her own growing. The wife said they should "soon get their title-deed, and be able, like the others, to put it in a frame, and hang it on the wall as a picture." The whole cost of a title to a property thus purchased, is £1. 13s. 6d. On procuring their title, members make their wills: for this purpose, they fill in blank forms of a will, which are kept at the office of the society, and cost them nothing! Ordinarily, the price of land and a house, amounting to £1[illegible] to £180, is paid up in ten to fourteen instalments; sometimes these instalments do not amount to more than the rent would have been for the same period. Many commence to pay 2s. to 3s. a fortnight when just out of their apprenticeship, and thus, when the time comes for them to marry and settle, they can pay half the price of the property, and a small sum only has to be borrowed from the society, which, being paid off by instalments, they soon live rent free, and have a property to bequeath. The freehold land have been powerful auxiliaries of the temperance societies. "Oh, Tom, you have been drinking a yard of land this morning," and "Thank God, not a foot of land shall go over my throat," are Birmingham jokes established by the movement. It is a marked feature of the movement, that it has been mainly conducted by the working classes themselves, with but slight assistance from those who usually take the lead in public questions. The system has spread to Wolverhampton, the centre of the iron trade. Land and building societies there number 4794 members, have purchased 150 acres of land, and made 1343 allotments for houses, nearly 900 of which are built. The gross receipts amount to £173,989. There are between 40 and 50 societies in Manchester which are flourishing. In Manchester, land is sold not outright, but let in perpetuity for a rent. In Liverpool, there are 180 societies, but generally on a smaller scale than in Birmingham and Manchester. Throughout England, and Wales, there are said to be 2000 land and building societies, comprehending more than 200,000 members, who have paid up more than eleven millions sterling, and invested eight millions in land and houses. These societies have had an important effect on the market price of land, competing with a previously small class of rich land speculators. One of the latest purchases of a Birmingham society was that of Aston Park estate, formerly the residence of the great James Watt. It measured 26 acres, cost £23,000, has a frontage of two miles, and is divided into 333 allotments, which have been freely taken up. It is not unusual to charge £40 to £50 for a plot. For instance, a plot of 114 square yards cost £44, being at the rate of 7s. 8½d. per square yard, £1865 per acre.

The character of the Society of Arts has been very much raised, during the last few years, by the instructive and interesting papers read before it—papers in which most important subjects have been introduced to sympathizing audiences, in a popular form. Of course, there have been occasional mistakes. It is curious that the greatest mistakes have been in connexion with the society's favourite idea, the International Exhibition

of 1862. Mr. Blanchard Jerrold's comparison of the year 1851 with the year 1861, was neither useful nor amusing; and yet the chairman had the bad taste to snub the gentleman who complained that a good subject had been spoiled, on the ground that Mr. Jerrold's exertions were gratuitous. The Society of Arts confers, as well as receives, a favour; for people seldom read a paper without having some object in view, and it is the duty of a lecturer to take pains with his lecture or to hold his tongue. Very interesting comparisons might be drawn between the condition of many leading manufactures and arts in 1851 and 1861, but the facts and figures could not be collected and condensed without the expenditure of time and trouble. Mr. Jerrold showed that, in future, he had better confine himself to his trade—writing smart, jerky newspaper articles. He knew nothing, and he told nothing. Mr. Simmonds touched on the mining industry, textile and woollen manufactures, the progress of steam navigation, and the growth of the Post Office. Mr. Wilson alluded to the sewing-machines which had come into use in England since 1851; but it was not to be expected that casual speakers should be prepared like the author of a paper. A great deal was to be said on improvements in the manufacture of gutta-percha, india-rubber, and various substitutes for leather; on the new supplies of valuable raw material from India; on the general use of reaping and mowing-machines; and on steam cultivation.

Mr. George Burnell's paper on recently-executed deep wells and borings—of which we give are port in another place, was a specimen of an essay, on a suitable subject—by a competent author; he gave his audience the latest information on a very important subject. Mr. Burnell condensed a vast amount of information, ancient and modern, on the subject of deep wells and borings. No engineering undertaking seems more uncertain than boring for water, as witness the many disappointments and heavy cost of the last artesian well executed in Paris, under the most experienced auspices; the borings at Brighton, made to save paying the water-works £25 a year, which have already cost several thousand pounds, without a sign of water; and the well at Rugby, which gives salt water instead of fresh. The celebrated artesian well of Grenelle was commenced in 1833, at the suggestion of Arago, and so little was known of the probable cost that the municipality of Paris only voted £720 for boring three artesian wells. Operations were commenced on the 29th of November, 1833, and, on the 26th of February, 1841, at a depth of 1806 feet 9 inches, of which 1378 were in the chalk, the water rose at the rate of 800,000 gallons per day. This well cost not £720, as estimated, but £14,000, and was exceedingly cheap at the money, having repaid its cost several times over. The success of the well at Grenelle led to many similar experiments in this kingdom as well as in France, which, in this country especially, have been singularly unsuccessful. At Southampton, a well was carried 1317 feet below the surface, and then abandoned. Mr. Burnell thinks that if they had gone 330 feet further, they might have found water. At Calais, a well was sunk through the chalk 1047 feet, and then 103 feet further into the transition rock, without finding water, At Kentish Town, the Hampstead Water-Works Company bored to the depth of 1302 feet, and, not succeeding in finding water, sold their undertaking to the New River Company. At Harwich, borings to the depth of 1025½ feet, passed into a black slaty rock, instead of the green sand, and this, too, was a failure. Mr. Burnell's final conclusion was, "*that it would be more rational to seek for coal under London* than for soft water. The French military authorities had executed, up to June, 1860, more than 50 artesian wells, for the purpose of forming stations for the caravans trading between Algeria and Central Africa, which give 7,920,000 gallons of water per day. The well at Passy, which has cost £40,000, has ruined the first contractor, a German engineer of great experience in well-sinking and boring, but it will probably be found a paying speculation by the municipality of Paris. Altogether, we are inclined to concur in Mr. Burnell's conclusion, that, under ordinary circumstances, deep boring for water is too hazardous a speculation for municipal authorities to undertake when the cost must be paid by taxation. But it would be well to try the experiment of artesian wells in the dry regions of Australia and South Africa.

Mr. T. Ellis is dissatisfied with our dissection of his plans for creating a revenue of £700,000 a year out of the sewage of London. It was not to be expected that he should like an operation so necessary but so painful for the patient. He has sent us three lengthy numbers of a daily paper, containing as many long letters on his sewage hobby. We have read them, and found a "terrible diarrhœa of words," but no facts. He bases his calculation of the value of a ton of sewage delivered ten miles from Charing Cross, on the analysis of Dr. Hofmann, the eminent chemist, experimenting on a choice specimen from a main sewer. The chemists do not pretend to give the commercial, they only give the theoretical value. It is just for all the world as if you asked a spirit broker the value of a certain sample of French brandy—say half a pint—and he having answered thirty shillings a gallon, you proceeded to calculate that a hogshead which had been drowned in a high tide of the Thames, and consisted of one part brandy and three parts muddy water, was worth 7s. 6d. a gallon. Parties familiar with gas-works will remember the precisely similar case of ammoniacal liquor, for which there is an unlimited demand, when it is pure and strong, at a price; but, if reduced below a certain strength, is absolutely unsaleable. This first fallacy of our friend Alnaschar Ellis is supported by an assertion equally fallacious—viz., that liquid sewage can be advantageously applied to all crops. The truth is exactly the reverse, as we have shown more than once. In this English climate, and even near Paris, grass crops are the only crops that will take a large dose of liquid manure; and even with Italian rye-grass, it often does more harm than good, making it fall and rot.

In the JOURNAL of Oct. 22nd, we gave extracts from M. Moll's *Annales de Vaujours* (a sewage-manure farm established near Paris under the direct advice of Mr. Edwin Chadwick, and with a subsidy from the municipality of Paris) which candidly admitted the difficulty of finding a crop which would both grow and sell under the stimulus of liquid sewage. After three years' experience, all M. Moll's skill and zeal have ended in losing his own time and money, and a large part of the capital of his shareholders. Without the assistance of the city of Paris, the concern would be bankrupt. Thus, the experiment in France has not been more successful than in England; and, until a score of farmers of capital and reputation can be found ready to pay any price for a daily flood of sewage, the Metropolitan Board of Works will do wisely to avoid brilliant bargains with penniless projectors. It is amusing to find that these golden visions of unlimited revenues to be obtained from the contents of our sewers—visions founded on a theory of "agricultural perpetual motion"—are only the revival of old stories. For instance, we read in one of the organs of the Board of Health in 1844 the following passages, worthy of an American finance minister:—"In this application (sewage), there is a mine of wealth, that will not only repay the expense of effectual sanitary arrangements, but benefit greatly the proprietors of the soil, and leave a considerable surplus for municipal improvements." . . . "It is proposed that a fund should be created, out of which the expense of all these improvements should be defrayed. The revenue realized, by the application of the liquid manure of the sewers to the fields, would, it is computed, reinstate within a term of years the original outlay with interest. After a certain number of years, the revenue thus derived would be available for the purposes of lighting and paving, and other similar purposes." Thus, we see that eighteen years have elapsed, and we are still in the stage of promises. The Board of Health, before dying of its failures, tried its hand at a series of towns—Morpeth and Exeter, Carlisle and Croydon, Southampton and Dover—and still, with the law in their own hands, the profits never came. Let the Metropolitan Board ponder on these things, and take care that it does not give up the substance for the shadow!

We learn from a paragraph which has been manufactured—not without an object—that Mr. Cyrus Field, of New York, is about to visit this country with a new scheme for an Atlantic telegraph. Mr. Cyrus Field is one of the four ingenious gentlemen who shared £75,000, the price of the right to land a cable in Newfoundland. The gentlemen who (see Blue-Book Report on Marine Telegraphs) ridiculed the idea of carefully testing the cable before laying it, and worked the whole business in a dashing, sensation, stockjobbing style, which paid them admirably, but ruined the shareholders, and for years depressed much sounder submarine telegraph plans, that may be forgotten in America, but will not be forgotten here. If there is to be a second attempt to unite the old and new worlds, we do not want the interference of scheming *concessionnaires* of the Field and Train order. The route must be selected,

the cable manufactured and laid, under the direction of engineers of character and experience; and it must be treated as a careful national experiment, not as a share speculation. As for the promises and guarantees of the Federalist Government, they are worth very little now, and will be worth less soon. Our own Government has a fund of reliable information in the report on submarine telegraphs, which, at any rate, ought to be sufficient to protect the national purse against the attacks of "promoters" and *concessionnaires*.

The plan for the new Blackfriars Bridge is not to be selected, it seems, without a fight. Nothing could show more clearly the low intellectual condition of the corporation of London than the fact that such a person as Mr. H. Wellington Vallance should have been permitted to settle the whole affair without consulting either the City architect or the City engineer, or any other professional adviser. What can Mr. Vallance know about architecture or engineering questions? It may be taken for granted that every public work undertaken by a corporation or a board is a job—that is to say, the decision usually depends on private influence and active canvassing. If the parties really interested are fortunate, it may be a good job—a good thing unfairly or ignorantly selected. It may be that Mr. Page's design is a very good design—it may even be the best design; but it was selected not because it was the best but because the committee was vigorously canvassed. The common councilman, who resisted Mr. Vallance's sharp practice, raised two plausible objections to Mr. Page's plan—viz., the great rise on the Surrey side—three feet six inches more than the present height—and the narrow extent of water-way at high tides under the long flat arches. It is quite clear that it was selected by a majority before the other designs had been properly examined; indeed, the examination of architectural and engineering designs by uneducated men of the common councilmen class, respectable shopkeepers, and talking attorneys, is a pitiable farce. If they are not convinced by private earwigging, they are fascinated by a showy water-colour elevation and a plausible description; they run round the room, full of their own importance, condemning and praising at a glance, not only without the faintest notion of the essential mechanical and artistic requirements of the building a bridge, but without the least respect for those who really have technical knowledge. There are so many purely professional points to be considered in selecting a bridge over the Thames, that common sense and common honesty would suggest the propriety of reducing the selection to two or three plans, and then taking the opinion of an architect and engineer on the comparative merits of the selected designs. If the London corporation will not refer to their own officers, they cannot do better than consult the eminent engineers on the Thames Embankment Commission, saying, "We mean to take one of these designs; which do you recommend, and what modifications, if any, will be required by an embankment of both sides of the river?" We still think that the railway bridge ought to be combined with the passenger bridge, but with three arches that is impossible.

The Metropolitan Board of Works seem determined to commit suicide at the earliest possible date permitted by the Act of Parliament which created their powers. It is a comfort to find that the hall in which they hold their little Parliament has been so well planned, although meanly ornamented, that it can always be let, at a fair rent, for many useful purposes. The stranger who, for the first time, takes a seat in the public gallery during one of the debates, cannot help being struck with the low tone of the principal speakers, who, one after another, indulge in claptrap commonplaces, for the especial benefit of their constituents—speaking always with an eye on the reporter for the penny parish-oracle. In fact, it is quite an American Assembly, in an oratorical point of view. On Friday last, the question of the proposed road through Hyde Park was debated, on a letter from the First Commissioner of Works, offering to bring in a Bill to vest the land in the Board, if they would undertake to make the road at an estimated cost of from £30,000 to £40,000. The Board has long been anxious to do something which would give it importance. The main sewers are a great work, but few can see them. The need of a communication between the north and the south sides of the park is obvious to any one, with eyes in his head, who cares to travel down the Bayswater or Kensington Roads; and, as the railroads on the north side will bring nearly 100,000 people a day to the Exhibition of 1862, a road is as much a national as a metropolitan question. The road, once made, would be an enormous public convenience to Chelsea, Brompton, Kensington, and all the district between the Edgeware Road and Westbourne Terrace, and even as far down as Bedford Square. Reasons might no doubt be urged why the Government, or the Commissioners of the Exhibition, or the parishes, should contribute to the work; indeed, a parochial attorney-kind of man will always find excellent reasons for doing nothing that costs anything. But, this is just the kind of work which would help to give the Board the importance it desires. The cost would not add a farthing in the pound to the local rates, but the rival orators are all so anxious to parade their economy before their over-taxed constituents, that they cannot afford to take a large view of a very small undertaking. The proposition for the road was very unfortunate in its Paddington supporter, Mr. Roche, who made a long, dreary, mock Chancellor-of-Exchequer speech, with a string of statistics, and never spared his audience a single farthing. The opposition were quite of the school of Viscount Williams—the cheese-paring school. One wanted the Holborn viaduct, and the other to buy Southwark Bridge, which would cost together about half a million; a third gave as a reason for not making this road in the West, that a parish in Deptford paid 13s. in the pound poor-rates. Mr. Eckett is, in every respect, a fine specimen of the parochial financial reformer, full of the most liberal speeches and the most cheese-paring principles. It is astonishing that the Board do not see that, if they do work they are asked to do by the Government, and do it well, they establish a claim on the Government for an increased source of means. Mr. Samuda gave it as his opinion that the road would cost £60,000; but, then, he is no authority on roads, unless it be on the cost of atmospheric railroads. We understand that an eminent firm have offered to make the road for £32,000. Mr. G. F. Train made a plausible offer for defraying the cost of the road. He proposed to give a farthing a head for the exclusive right to work a tramway from Bayswater to the Exhibition. It is a pity that so good a plan did not come backed by some more popular name. According to appearances, the road will be debated—like the late Lord Londonderry's objections to the Reform Bill—until the guns give notice that the Exhibition is open. Then the gates of the park must be opened, and the Metropolitan Board will have lost a chance of acquiring popularity that is not likely to occur again.

PITFALLS OF THE PATENT LAWS.

The proceedings of the Court of Chancery on the long-litigated question of the validity of Mr. Hills' patent for the purification of gas has brought into a prominent point of view some of the imperfections of the law which professes to define and regulate patent monopolies. The case, after passing in various forms through the courts of law—the plaintiff having been nonsuited in one action, and been successful in another—was dragged into Chancery, and, now that the term of protection has nearly expired, it has been finally decided in favour of the patentee. But the judgment of the Lord Chancellor has opened new matter for discussion, and, in confirming the validity of one patent, it has placed the majority of others in danger. Again and again, in the course of the arguments, his lordship regretted the want of any rule to define the amount of information as to a previous patent, which should annul a subsequent one for the same object, and he concluded by proposing a rule, which, if strictly observed, would jeopardize nearly every existing patent.

While yet apparently in a state of doubt, the Lord Chancellor said he apprehended that "the antecedent statement must be such, that a person, of ordinary knowledge of the subject, would at once perceive, understand, and be able practically to apply the discovery, without the necessity of making further experiments, and gaining further information before the invention can be made useful." In that expression of the requirements of a valid specification, we conceive that all will agree, for, unless it convey sufficient and clear information how the invention is to be applied, it would fail to comply with an essential condition on which all letters patent are granted. But the extension of those requirements, implied in the succeeding observations of his lordship, opens a wide and doubtful question: "There is not, I think, any other general answer that can be given to that question than this—that the information as to the alleged invention given by the prior publication, must, for the purposes of practical utility, *be*

equal to that given by the subsequent patent;" and again: "If something remains to be ascertained which is necessary for the useful application of the discovery, that affords sufficient room for a valid patent."

It would appear, from these expressions of the Lord Chancellor, that he would pronounce any improvement of a previous invention to form sufficient ground for a valid patent; and, if so, the legal rights of patentees would be scarcely worth preserving, for there are few inventions in which improvements might not be readily made. Thus, an original inventor, who had, by the inspiration of his inventive faculties, conceived, and, after great labour and expense, usefully applied, a scientific principle, might find himself deprived of the fruits of his genius and labour, by a mere mechanical alteration that produced greater facility of action. It is an important question, if the patent laws are to be maintained, how far a scientific principle should be monopolized by one individual; but, if patented inventions are to be summarily superseded in the manner intimated by the Lord Chancellor, it would be far better for inventors to trust their chance of remuneration to secrecy and to the first possession of the market, rather than to rely on the delusive protection of letters patent.

Though the validity of Mr. Hills' patent is now fully established, so far as concerns precipitated or artificially-prepared oxides, it would be possible, if the interpretation of the law by the Lord Chancellor be held good, by some addition to his process to deprive his patent of its value. There is, indeed, a question still pending, the decision of which may seriously affect his interests. A native oxide of iron has been discovered, that will effectually absorb sulphuretted hydrogen, and may be practically used in the purification of gas. The employment of a native oxide for that purpose does not, as intimated by the Lord Chancellor, interfere with Mr. Hills' patent, which is for the purification of gas by a hydrated oxide of iron, prepared artificially. Should that point be decided against him, the question would then have to be determined, whether Mr. Hills can monopolize the revivification, by the action of nature, of a substance not included in the patent. This is a broader and more important question, as it affects the operation of the patent laws, than the one that has already occasioned so much litigation; and the legal profession may still rejoice in the prospect of a plentiful crop of fees from arguing for and against the claims of a patentee whose term of protection will expire before the lawyers have determined how far his patent protects him. Unfortunately, the case of Mr. Hills is not exceptional. All proprietors of remunerative inventions are more or less forced into lawsuits to protect their monopolies; and thus, by the present system of our patent laws, inventors either purchase the monopoly of an invention that is worthless, or, if it prove valuable, their property is invaded, and they find that the patent privilege they have obtained is the very questionable one of being permitted to contend for their rights in a court of law.

Incidental to the proceedings in the case of Mr. Hills, another question of great importance to the administration of justice was mooted, and which affects not only the disputed validity of patents, but all other trials wherein scientific evidence is required. The Lord Chancellor said: "He believed that it was a common thing for a patentee to go to a chemist, and give him a retaining-fee of ten guineas as his witness at the trial, for the purpose of obtaining his evidence in his favour; and, if that was true, it was a practice that could not be too strongly condemned." His lordship observed, further, that he should not pay the least attention to the evidence of a man who had "hired himself as a witness." We fear there is too much truth in the existence of such a practice as that which the Lord Chancellor condemned, and that it extends in some instances not only to the retaining of those who it is supposed will give favourable evidence, but, that others whose evidence might prove disadvantageous are retained to prevent their being called by the other side. By this lavish distribution of fees, it is possible for a rich patentee to maintain a patent that is really worthless. We trust that this severe public censure by the Lord Chancellor will be sufficient to put a stop to a practice that is most derogatory to the character of science and its professors. It is objectionable, not because scientific men would be induced by fees to give evidence opposed to their convictions of what is the truth, but their minds might be biassed by being engaged to support a particular side of a question, and they would thus be prevented from giving it a fair consideration. As Mr. Grove expressed it, "Scientific witnesses, having got their minds attracted to one side, saw one colour on one side of the shield, and on the other side another." There can be no mistake about the intention with which such fees are offered. They are intended to operate as bribes for the perversion or the suppression of truth, and those who resort to such disgraceful artifices to gain their cause in a court of justice ought to be amenable to the same punishment as those who are guilty of the subornation of witnesses.

Circular to Gas Companies.

"Settling-day," whether at the "corner" after a Derby race, or at the end of a chancery suit, or in every household when the Christmas bills come to be added up, often produces serious financial difficulties; and, if we may judge from the report of the case *Wyatt v. the Metropolitan Board of Works*, which appears in another column, the successful promotion of a Bill in Parliament has its dark side when the costs are to be paid.

Mr. Wyatt was the parliamentary agent employed to pilot through both Houses the Bill which he had prepared, in conjunction with Messrs. Hughes and Beal, to redress the imagined grievances inflicted on the public by the metropolitan gas companies. It will be remembered that, soon after the arrangement made by the companies, in 1857, to divide the metropolis into districts, and to assign a separate one to each company, there was a burst of indignation from the parish orators, who incited the parochial authorities to rouse themselves to oppose the monopoly which that arrangement created. Marylebone took the lead in the movement—from which, however, it afterwards saw reason to withdraw—and in all the parishes there were indignation meetings, at which speeches the most violent and abusive were uttered, and grossly fallacious representations were made, for the purpose of exciting gas consumers to take part in the agitation to restore competition in the supply of gas. The press lent its aid to fan the flame, and by these means a formidable opposition to the gas companies was got up. Delegates were nominated by the parishes to form a convention for the redress of gas grievances, money was subscribed to carry on the war, and the leading members of the convention were appointed managers to direct the measures by which the redress of the alleged grievances was to be obtained. During two sessions of Parliament, committees of the House of Commons listened to their complaints; but, when thus openly investigated, the mighty movement was found to have been a mountain in labour to bring forth a mouse. Not satisfied with the ridiculous exposure of their fancied grievances, the delegates determined to concentrate their attack on the gas companies in the form of a Bill; and, as if to exhibit the utter folly of their conduct, the preamble of their Bill declared it to be expedient to continue the districting arrangements which had roused their indignation, and had formed the ground of the agitation they had excited. Another anticipated grievance was, that the charge for public lighting would be increased in consequence of the cessation of competition, yet the Bill authorized a great increase of price by placing the supply of gas to the public lamps on the same standard as that to private consumers.

After an investigation of almost unparalleled length, the Bill passed through Parliament, and the Act thus obtained has been described by Mr. Hughes, who worked indefatigably on behalf of the delegates, as "a valuable one, and, if not perfect, it contains, at all events, the germ of better and more successful legislation." He states, indeed, in his "Commentary on the Metropolis Gas Act," that, by raising the standard of illuminating power, it has conferred a *bonus* equivalent to £200,000 a year on the gas consumers of London, with the important prospective advantage of a reduction in the price from the operation of the dividend clauses. As the Act bestows, according to Mr. Hughes's statement, such important benefits, he presumed that no very serious objection could be taken by any metropolitan vestry or district board to the clause, which the promoters inserted in the Bill, providing that the costs and charges incidental to the passing of the Act, and the preliminary expenses, should be paid by the Metropolitan

Board of Works out of funds to be levied from the several vestries and district boards. It might have been supposed that, under such circumstances, the bill of costs would have been paid without a murmur; but, unfortunately for Mr. Wyatt, some persons differed from Mr. Hughes in their appreciation of the benefits conferred by the Act, and required that the bill of the parliamentary agent, and that of Mr. Beal, should be taxed by the taxing officer of the House of Commons, who dealt with them somewhat severely. Items amounting to more than £1200 were struck off from the two accounts, on the ground that they were not costs incidental to the passing of the Act, but expenses incurred in the preliminary agitation. The Metropolitan Board further deducted from Mr. Wyatt's account the sum of £1413 already paid to him by Mr. Beal, and after that deduction offered Mr. Wyatt a cheque for the balance of his taxed costs, amounting to £1620. 18s. 10d. That offer he refused to accept, and forthwith he commenced an action in the Court of Common Pleas against the Board, under the 56th section of the Metropolis Gas Act, for the payment of his taxed costs. The Board then, by the advice of counsel, raised the question whether that section of the Act gave Mr. Wyatt any claim whatever upon them. To that plea Mr. Wyatt demurred, but, after the case had been fully and ably argued, the court unanimously decided that Mr. Wyatt could only claim to be paid *by the parties who employed him;* and that the claim on the Board must be made by them. The reason given by the judges for this decision was, that if the Board were to pay each person separately for work done in promoting the Bill through Parliament, they might have claims on them from all quarters. Mr. Wyatt is, therefore, for the present, left without his money, and will have to apply for it to the delegates, who must obtain his receipt for the amount of his bill of costs before they can claim to be reimbursed by the Board.

The fate of Mr. Wyatt is not very encouraging to professional men who may be tempted to espouse the cause of agitators against alleged grievances, however popular may be such a course of action at the time. No one can question the ability and perseverance with which he conducted the case of his clients, and he gained the respect of his opponents by the urbanity and good humour he uniformly exhibited, frequently under very trying circumstances. But he is now left, by those who ought gladly to recognize the value of his services, to have recourse to courts of law to obtain long-delayed remuneration for his skilful and arduous exertions in their behalf.

The question whether the Great Central Gas Company are authorized by the Metropolis Gas Act to raise the price of the gas they supply from 4s. to 4s. 6d. per 1000 feet, was argued before the judges of the Court of Common Pleas on the 6th instant, and their unanimous judgment was given in favour of the company. The judges took nearly the same view of the case as that taken by Mr. Gibbon, when consulted by the Commissioners of Sewers, in opposition to his senior counsel, the Recorder and Mr. Bovill. They rested their decision principally on the ground that the Metropolis Gas Act makes it illegal to supply gas of the low illuminating power specified in that of the Great Central Company. The special Act is, therefore, inconsistent with the general Act; and their lordships declared that such inconsistency amounts effectually to a repeal of the previous one, though it is not repealed expressly in words. The repeal of the former Act, they considered, must have been intended by Parliament, for it was not reasonable to suppose that the Great Central Company should be compelled to supply, for the same price, a better kind of gas than they were bound to supply by their Act. This judgment will render it unnecessary for the Great Central Company to attempt to proceed further with their Bill to remove the doubts that had been raised of their power to equalize the price of their gas to that supplied in other districts of the metropolis. The Bill introduced by the corporation to exclude the City of London from the operation of the Act of 1860 is, consequently, the only private Bill before Parliament which affects any of the metropolitan gas companies, and it is very doubtful whether that will long remain among the parliamentary notices. The object of the Bill is opposed to the uniformity in the supply of gas to the metropolis, which it was one of the objects of the Metropolis Gas Act to establish: it would place the City in a lower position than all other parts of London in the condition of its gas supply, while it would occasion embarrassing complications in the arrangements of the company which supplies gas to other districts as well as to the City. Even the metropolitan members are sick of gas, and are disinclined to create an exceptional state of things to gratify the spleen of the Commissioners of Sewers, whilst the members generally would object to reopen a question which has been settled after three years discussion. It seems most probable, therefore, that if the Bill be opposed on the second reading, it will be thrown out without being referred to a committee.

Captain Shaw, the superintendent of the London Fire Brigade, appears to have inherited from his predecessor, the late Mr. Braidwood, all his prejudices against gas, and to be equally ignorant with that gentleman of the phenomena of its combustion. In his annual report of the fires that have occurred in the metropolis during the past year, he attributes the causes of nearly 100 out of the 1183 fires which required the assistance of the brigade to the direct agency of gas, in one way or another. He lays more stress on this than on any other cause of fire; and the *Times*, following ignorantly in his wake, cautions the public to be extremely careful in the use of this "dangerous light:" and, in addition to the fires set down by Captain Shaw to the account of gas, the writer gives "the lion's share" of the "unknown causes" to the same agency. Even the cases of spontaneous combustions may, according to the same authority, be attributed to the drying-up of wood-work by the constant use of gas.

These attempts to create a prejudice against gas lighting, when it has become nearly universal in all the large towns of the kingdom, are as ill-founded as they are senseless. No one will deny that gas is dangerous; and that, from ignorance, neglect, or the want of reasonable precaution, it may be the means of setting a house on fire. There can be no doubt also that everybody would be much safer if they would but be content to remain in darkness, and not burn any light whatever. Fires are still more dangerous; and there would be a great saving of risk as well as of money, if people would abstain from burning such dangerous materials as coal and wood; for it appears, from Captain Shaw's report, that no fewer than 3,000 chimneys were set on fire in the course of last year. If, however, people will not be satisfied in darkness, or when shivering with cold, they must run some risk, whatever source of light or heat they apply; and the question is, not whether gas is dangerous, but, whether it is more dangerous than any other material that could be practically employed for illumination? The fact stated by Captain Shaw that, during the past year, *one hundred and fifty fires were caused "by the incautious use of candles,"* is of itself a satisfactory answer to his objections to gas. It may be confidently asserted that, had the houses in which those fires occurred been lighted throughout with gas, not one-tenth of them would have required the aid of the fire brigade. As to the supposed danger arising from the drying up of wood-work by the heat of gas flames, we recommend Captain Shaw to light an argand gas-burner in a small closed room for a few hours, and then observe the effect; and we think that the streams of water running down the window and the walls would convince him that there is little danger of producing excessive dryness by the burning of gas.

We have a right, when contending for the comparative safety of gas lighting, to proportion, if we can, the number of accidents caused by its combustion with the quantity of light obtained, in the same manner as in estimating the comparative safety of railway travelling, the number of persons killed or injured is compared with the number of passengers conveyed; and, if that scale of proportion were adopted, the strongest opponents of gas must admit its superlative safety, compared with the production of an equal amount of light by any other means. But, setting aside the great advantage of additional light which gas affords, there cannot be any doubt that, for the necessary purposes of illumination, it is much safer than the employment of moveable lights. Of course, as the consumption of gas extends, the number of fires caused by negligence, or the improper use of it, will increase also; but the report of Captain Shaw affords evidence that gas is much safer than candles, and even he will not deny that it is cleaner and more economical.

The hearing of a motion, on the part of Mr. Hills, for an injunction to restrain the Liverpool United Gas Company from using a native oxide of iron for the purification of gas, commenced before Vice-Chancellor Wood on Friday last, and was concluded yesterday, when the Vice-Chancellor intimated his intention to give judgment on Friday next.

Register of New Patents.

1730.—Frederick Warner, of the Crescent, Jewin Street, and Thomas Clark, of Baldwin Street, City Road, for "*Improvements in apparatus for supplying water to water-closets.*" Provisional protection only obtained. Dated July 8, 1861.

This invention has for its object improvements in apparatus for supplying water to water-closets. For this purpose, and in order to insure that only a determined quantity of water shall be supplied to the basin of the water-closet each time the closet is used, the following combination of apparatus is applied. The water from the source of supply is received into a small vessel, which is preferred to be of a semi-cylindrical form, with axes or necks at the ends, which turn, on suitable bearings, in an outer cistern or vessel, of somewhat larger dimensions than the inner one, which receives the water from the source of supply. At the bottom, or lower part, of the outer vessel is an outlet, with a pipe working with the basin of the water-closet; and it is preferred that this outlet at the bottom of the outer vessel should be conical. The inner vessel, which first receives the water, is arranged to be turned by the ordinary handle of the water-closet, or by other means, by which the contents of such inner vessel will be emptied into the outer vessel, and such water will descend into the basin of the water-closet, so soon as the inner vessel has again assumed its horizontal position. The water will not flow from the outer vessel to the water-closet before the inner vessel assumes its correct position, by reason of there being a valve in the outlet, which is in connexion with the inner vessel, and which is closed till that vessel assumes a position again to receive a fresh supply of water. The water is supplied to the inner vessel from the main, or other source of supply, by means of a valve, which is by preference regulated by a float in such a manner that, as soon as there is a proper supply of water in the inner vessel, the float shuts off the further supply; and, when such inner vessel is tilted, the float is retained in such a position as to prevent the valve or plug on the supply-pipe opening till the main vessel has emptied its contents, and has again assumed a horizontal or correct position to be again supplied with water. When a float is not used, the supply-valve or plug is to be regulated by other means.

1739.—William Coulson Parkinson, of Cottage Lane, City Road, London, gas-meter manufacturer, for "*An improved frictionless bearing for gas-meters.*" Patent dated July 9, 1861.

Instead of having the crank, flag-wire, and other similar moveable parts, turned down at the end, so as to run in a socket or bearing as in ordinary dry gas-meters, the shaft is pointed, or a piece of glass or other material—as flint, pot, china, stone, or earthenware—is put in the place of the socket, for the point of the shaft or spindle to work upon—thus reducing the friction to a minimum. By this means, also, the bearing cannot get fouled, as the ordinary spindles and bearings generally do by the dirt that accumulates around them, for, by the present invention, the point of the shaft wears away the dirt as it accumulates. The frictionless bearing can be applied to other parts, such as the crank-spindle, which gives motion to the valves and index; and it can be also applied to wet gas-meters.

The claim is for the application of the frictionless bearing hereinbefore described, to dry and wet gas-meters.

1741.—Charles Cochrane, of Ormesby Iron-Works, Middlesborough-on-Tees, for "*Improvements in treating gas in its passage from blast-furnaces to the furnaces, stoves, boilers, or other heating apparatus where the gas is employed.*" Patent dated July 9, 1861.

This invention consists in applying to a blast-furnace exhausting or forcing machinery, together with a scrubber, or apparatus capable of dividing the gas, after it comes from the head of the furnace, into very numerous minute streams or divisions, and capable also of subjecting the gas, when so divided, to the action of water in such a manner as to remove the dust from the gas. In carrying out this invention, the construction of the scrubber or apparatus used for dividing the gas into very numerous minute streams or divisions, and for applying water thereto, may be greatly varied, and no claim is made separately to the construction of scrubbers, whatever be their arrangement and construction. The exhausting or forcing machinery, which it is preferred to employ, consists of pumps such as are used for forcing air to blast-furnaces, though the arrangements of exhausting or forcing apparatus may be used when carrying out this invention; and no claim is made separately to the exhausting apparatus, whatever may be its construction or arrangement.

1748.—Joshua Kidd, of 289, Strand, Middlesex, civil engineer, for "*Improvements in the manufacture, application, and combustion of gases, and in apparatus connected therewith.*" Provisional protection only obtained. Dated July 11, 1861.

From the centre of the interior of a gasholder, dipping into a tank or well in the usual way, is suspended a piece of zinc, iron, or other proper material. The tank is partially filled with acid or other proper liquid. As the gas is generated by the action of the acid or liquid on the suspended zinc, iron, or other material, it rises through the acid or liquid, and forces the holder upwards. Proper means are used for permitting the escape of gas for use. If the gas is generated quicker than it escapes out of the holder, its pressure forces the holder to rise higher out of the tank, thus lifting the suspended zinc, iron, or other material out of the acid or liquid, and thereby stopping the generation of the gas till sufficient has escaped to allow the holder to fall, and the suspended zinc, iron, or other material again to come into contact with the acid or liquid.

The gas thus generated is carburetted, when requisite, by bringing it by proper means into contact near the point of combustion with the vapour of naphtha or benzole.

The holder can be made fixed, and in that case the pressure of the gas forces a portion of the acid or liquid which is inside the holder below the suspended zinc, iron, or other material; thus, stopping the generation of gas till sufficient has escaped to allow the acid or liquid to rise and again come in contact with the suspended zinc, iron, or other material.

In the combustion of the gas, a burner is used of a novel shape, the peculiarity of which is, that there is a hollow chamber in the centre of its top, so that the point or points of the escape of the gas is or are materially below the level of the top of the burner. This burner has, in its interior, a fish-tail nib, or it can also be used as a cap to fit on the usual fish-tail or bat's-wing burner, and, when so used, it may or may not have such internal nib. This burner or cap may also be used in the consumption, and for the better combustion, of coal-gas.

1754.—Thomas Good Messenger, of High Street, Loughborough, Leicester, horticultural builder and plumber, for "*Improvements in the construction of valves.*" Patent dated July 11, 1861.

These improvements consist, in the first place, in forming a chamber with a valve-seat, and a valve constructed of brass, or other suitable material, the valve opening quite back, so as to give the same capacity in the valve as that which is in the pipe, with which it is connected; secondly, in constructing a spindle working through a stuffing-box, or inside the chamber before mentioned, to which spindle the above valve is attached, and which said spindle forms the hinge of the valve: a toothed quadrant is fixed to the said spindle, and is acted upon by a worm or screw and wheel, or by a handle, or other suitable contrivance, so that the operator may be enabled to open the valve any required distance; and, thirdly, in constructing a lid or door, which may be removed with ease and at pleasure, should the valve require cleaning or repairing, without disturbing the pipes, or breaking a joint.

The claim is for—

1. The employment of a chamber for a valve to work in, so that it may open quite back therein, in the manner, and for the purpose, described.

2. The employment of the valve-spindle, arranged and actuated as described.

3. The arrangement and combination of parts hereinbefore described.

1760.—George Rydill, of Dewsbury, York, for "*An improved smoke-consumer and condenser, suitable for factories, railway-engines, steam-ships, furnaces, brick-kilns, cinder-ovens, bakehouses, and other purposes, namely, ventilation of factories, Houses of Parliament, places of public worship, public institutions, dwelling-houses, streets, coal-mines, railway-tunnels, mineral-mines, iron-works.*" Provisional protection only obtained. Dated July 13, 1861.

According to this invention, the smoke from the fire or fires passes into a flue or flues, which are set with fire-bricks, where it is played upon with water-springers, hot or cold, which is conveyed from the boiler by means of pipes. The water playing against the smoke as it travels along towards the chimney, causes a combustion and a condensation to take place, which washes the carbon and sulphur out of the heated body which makes it way out of the flue, leaving a white vapour to rise from the chimney. The draughts created by the pressure of the water from the boiler, and the combustion of the same in the flues, are so great, that no chimney is required to create a draught. The water that is drawn into the flues, chimneys, or openings, by the springers, &c., is collected, being valuable for commercial purposes.

APPLICATIONS FOR LETTERS PATENT.

193.—William Johnston, of Glasgow, N.B., metal-merchant, for "*Improvements in lamps.*" Jan. 25, 1862.

217.—John Hunt, of Birmingham, brassfounder, for "*An improvement or improvements in the manufacture of gas and other chandeliers.*" Jan. 28, 1862.

226.—William Edward Newton, of 66, Chancery Lane, London, civil engineer, for "*Improvements in engines to be employed for pumping or forcing air or water, or for other purposes where a rectilinear motion is required.*" A communication. Jan. 28, 1862.

246.—Edward Alexander Rippingille, of Staple Hill, near Bristol, for "*Improvements in engines worked by steam, or other fluid, and in pumps.*" Jan. 30, 1862.

257.—Hermann Schatten, of Hesse Cassel, civil engineer, for "*Improvements in the manufacture or construction of gas-meters.*" Jan. 31, 1862.

261.—John Hargreaves, of 12, Clifton Cottages, Clifton Road, Peckham, for "*Improvements in the manufacture of pipes or tubes for conveying water, gas, acids, sewage, enclosing electric telegraph wires, and for other purposes, which improvements are also applicable to the manufacture of other vessels and articles, and in the machinery or apparatus connected therewith.*" Jan. 31, 1862.

264.—Edward Henry Cradock Monckton, Esq., of Fineshade, in the co. of Northampton, for "*Obtaining ammonia, and other useful products, by means of electricity direct from the atmosphere, and other sources, with economy of fuel and prevention of smoke.*" Jan. 31, 1862.

270.—Leon Fauvel, of Paris, manufacturer, for "*Improvements in apparatus for indicating the existence of escapes in gas-tubing, and for stopping the continuance thereof.*" Feb. 1, 1862.

290.—George Manwaring, of Southampton, engineer, for "*Improvements in flushing apparatus for closets, sewers, and other water-services.*" Feb. 4, 1862.

297.—James Webster, of Birmingham, engineer, for "*Improvements in gas-fittings.*" Feb. 4, 1862.

316.—Michael Henry, 84, Fleet Street, London, patent agent, for "*Improvements in obtaining and applying motive power, and raising and forcing liquids, and in apparatus employed therein.*" Feb. 6, 1862.

GRANTS OF PROVISIONAL PROTECTION.

2342.—John Hays Wilson, of the firm of John Hays Wilson and Co., of Liverpool, brassfounders and ships' ironmongers, for "*Improvements in pumps, chiefly applicable to ships' lift-pumps.*" Sept. 19, 1861.

2415.—George Smith, of Liverpool, brass and Britannia metal-finisher, for "*Improvements applicable to gas-meters.*" Sept. 27, 1861.

2769.—WILLIAM CLARK, of 53, Chancery Lane, engineer and patent agent, for "*Improvements in water-meters.*" A communication. Nov. 4, 1861.

11.—BENJAMIN RHODES, of Old Ford, Bow, for "*Improvements in forming or making straight and bent pipes and bends for pipes, and also vessels of various shapes, and in coating and protecting objects and articles of various forms, and in the apparatus to be employed therein.*" Jan. 1, 1862.

61.—JOHN BRUNT, of 15, Rue Petrelle, Paris, engineer, for "*Improvements in gas-meters.*" Jan. 9, 1862.

67.—RICHARD ARCHIBALD BROOMAN, of 166, Fleet Street, London, patent agent, for "*Improvements in apparatus for carburetting and burning gas.*" Jan 9, 1862.

163.—LOUIS MARTIN, chemist, No. 13, Rue Gaillon, Paris, for "*Improvements in the treatment of mineral oils, and in the apparatus connected therewith.*" Jan. 22, 1862.

164.—ISAAC ROBERTS, of Liverpool, contractor, for "*Improvements in combined hydraulic motive-power engines and meters.*" Jan. 22, 1862.

193.—WILLIAM JOHNSTON, of Glasgow, N.B., metal-merchant, for "*Improvements in lamps.*" Jan. 25, 1862.

217.—JOHN HUNT, of Birmingham, brassfounder, for "*An improvement or improvements in the manufacture of gas and other chandeliers.*" Jan. 28, 1862.

246.—EDWARD ALEXANDER RIPPINGILLE, of Staple Hill, near Bristol, for "*Improvements in engines worked by steam, or other fluid, and in pumps.*" Jan. 30, 1862.

NOTICES TO PROCEED.

2342.—JOHN HAYS WILSON, of the firm of John Hays Wilson and Co., of Liverpool, brassfounders and ships' ironmongers, for "*Improvements in pumps, chiefly applicable to ship's lift-pumps.*" Sept. 19, 1861.

2363.—HENRY COCKEY, and FRANCIS CHRISTOPHER COCKEY, of the Frome Iron Foundry, in the co. of Somerset, engineers, for "*Improvements in apparatus employed in the manufacture of gas.*" Sept. 21, 1861.

2396.—THOMAS RICHARDSON, of Newcastle-upon-Tyne, chemist, for "*Improvements in the manufacture of muriate of iron for the purification of coal-gas.*" Sept. 25, 1861.

2415.—GEORGE SMITH, of Liverpool, brass and Britannia metal-finisher, for "*Improvements applicable to gas-meters.*" Sept. 27, 1861.

2426.—DENNY LANE, of the co. of the City of Cork, secretary of the Cork Gas Consumers Company, for "*Improvements in apparatus whereby to regulate the passage or flow of gas, water, and other fluids.*" Sept. 28, 1861.

2444.—OSCAR OCTAVE LESOURD, of Paris, but temporarily residing at Panton Street, London, barrister, for "*Improvements in joining pipes and tubes, or in forming or securing the joints thereof.*" A communication. Oct. 1, 1861.

2495.—WILLIAM CLARK, of 53, Chancery Lane, London, engineer and patent agent, for "*An improved gas-regulator and purifier.*" A communication. Oct. 5, 1861.

2496.—THOMAS HUGHES, of Birmingham, manager of the Imperial Iron-Tube Company, for "*An improved high-pressure tap for regulating and controlling the flow of steam, water or other fluids.*" Oct. 5, 1861.

2696.—BARTOLOMEO PREDAVILLE, of 143, Fleet Street, London, civil engineer, for "*A new mode of, and apparatus for, producing and obtaining a hydro-pneumatic motive power.*" Oct. 28, 1861.

2761.—GEORGE EVANS, of 69, Gloucester Terrace, Portman Square, for "*Improvements in treating peat to render it useful as fuel, and for illuminating and metallurgical purposes.*" Nov. 2, 1861.

2795.—JOHN RICHARDSON WIGHAM, of Capel Street, in the city of Dublin, for "*Improvements in apparatus for the manufacture of gas, parts of which are also applicable for cooking purposes.*" Nov. 7, 1861.

Parliamentary Intelligence.

HOUSE OF COMMONS.

FEBRUARY 7, 1862.

SALE OF GAS.—Return [presented February 6] was ordered to be printed.

The HIGHWAYS Bill was read a first time, and ordered to be read a second time, and to be printed.

Legal Intelligence.

COURT OF CHANCERY.

MONDAY, JAN. 20.

(*Before the* LORD CHANCELLOR.)

HILLS *v.* EVANS.

[*Continued from page 55.*]

Mr. GROVE resumed his argument, and said, when his lordship rose on Saturday, he was about to address himself to that which appeared to be passing in his lordship's mind during Mr. Bovill's argument, as to whether the two specifications of Laming and Hills could both stand separately, and as separate inventions. Upon this point, his lordship would recollect that Mr. Bovill had cited several cases; but, as far as he could gather, they were all bearing on mechanical inventions, in the strict sense of the term: and all that was deduced from those cases was the rule of law, which he should not, in the least degree, attempt to dispute, that the taking of the material parts of another man's invention might or might not be an infringement. His lordship would see, when he should come to those cases, that they were of such a nature as to speak to the eye; and, if a man formed a machine with a peculiar lever or wheel, both being material parts of the invention, if a person subsequently took the wheel or lever, an appropriation of either of them would be apparent to the eye, and would be taken as an infringement. His learned friend had referred to the case of *Lister v. Leather*, and other cases where the facts were somewhat similar, but none of them were chemical cases, as was pointed out by the Lord Chief Baron, and, therefore, they could not refer to them in this case as they could in the case of a mechanical invention. It might be that changes in chemical combinations would make little or no difference, but that could only be judged of by experiments, and to reach that result to enable any one to judge of them could only be settled by experiments. They could not tell what the analogy between untried and chemical results would be. If, therefore, a party was not allowed to have a separate and independent patent for a separate discovery, although that discovery might have been ignorantly involved in a previous discovery, they would lose some of the greatest blessings ever conferred upon mankind. The case of *Heath v. Unwin* showed that the carbonate of manganese was used by two persons for the same object; and there were several other cases in which the same doctrine was observed, but they were mechanical cases. In the case of *Minter v. Moore*, alluded to by his learned friend, more was claimed by the plaintiff than was contained in his specification. There the plaintiff invented a peculiar form of lever by which the chair was made to recline, and it was put in evidence what that invention was, which showed that it was involved with certain other encumbering machinery. In the second case it was not, and therefore it was held to be a new invention. It was said that the man only claimed for what he had discovered; and, although it did include what had belonged to the previous man, it was so mixed up and encumbered that it was held not to be an infringement. Then, there was a case alluded to, which was for making tubes, if they were wanted of a great length, without the use of a mandrel, and the patentee sought to dispense with the use of the mandrel. By making these long pipes without the use of the mandrel, it was looked upon as an invention of great importance and advantage.

The LORD CHANCELLOR: Is there something in the case referred to as a substitute for the mandrel?

Mr. GROVE: I think not.

The LORD CHANCELLOR: How is the welding affected?

Mr. GROVE: By the metal being passed through rolling dies, and thus formed into shape.

The LORD CHANCELLOR: Just explain what part of the old specification was taken in the new patent.

Mr. GROVE: I do not think it was a case as to the old specification, but as to the old user.

The LORD CHANCELLOR: It was an attempt to show the antecedent use of the mandrel, and that the patent was a part of the old process.

Mr. GROVE: Up to that time, it was supposed to be impossible to have a welding without a core in the centre.

The LORD CHANCELLOR: Suppose this pencil to be a mandrel, then was the iron tube drawn over it, and heated and welded?

Mr. GROVE: It was drawn through a pair of dies or grooved rollers, and then drawn to a great length.

The LORD CHANCELLOR: There was the case of *Collins v. Muntz*, which gives us some information as to that.

Mr. GROVE said, he intended to refer to that, but he would now cite the case of *Booth v. Kennard*, in reference to gas being obtained from seeds without pressure; and it was assumed that that might be the subject of a patent. It was argued that the patentee sought to obtain the same results as had been previously arrived at by the old process of pressure from seeds, and was enabled to distil the gas from the seeds without going through the previous pressure. Then, there was the case of *Newton v. Boucher* (6 Exchequer Reports, p. 859), in reference to metal used for a stuffing-box. Another person applied the same metal to lessen the friction of wheels, and it was not held to invalidate the patent, because it was a new application to an old discovery. In all those cases cited, they were inventions which spoke to the eye; they were cases where the alleged combination involved mechanical elements obviously visible to the eye; and all the court had decided was, not that it must necessarily be an infringement, but that it might be an infringement if a person, who was making experiments, could see at once the separate elements, and claim the use of them as separate things. It would hardly require an argument to say, that he could not; so that, in all cases, no absolute rule could be laid down; and, in all cases, it was held by judges that those were purely questions for the jury, except under certain circumstances, and that was, where the facts were admitted. In *Bush v. Fox*, tried in the House of Lords, on a patent for a *caisson* for working under water, where the same thing had been used before under a patent. This case was not one of alleged infringement, but a separate invention. In the case referred to, the judge compared both patents, and, finding both claimed for the same thing, he directed the jury to find a verdict for the defendant; and, in giving judgment, Lord Cranworth held that Lord Cochrane had invented and used the same thing for years before.

The LORD CHANCELLOR: That was a question of fact.

Mr. GROVE said, his lordship would recollect that while the case was pending in the House of Lords two other cases were cited, and Lord Cranworth said they were different cases.

The LORD CHANCELLOR said, the case of *Bush v. Fox* referred to, seemed to establish the identity of the two things, and was tried on the specification alone.

Mr. GROVE said, he would suppose a case where a chemist had mixed up three liquids, or two liquids and a solid, and found that it would be exceedingly valuable as applicable to machinery, or to portable gas, and patented it knowing nothing as to the *rationale* of it, and another man should find out other properties which would arise from a new chemical action by which an unknown substance was eliminated when discovered, giving its effects in a cheaper and higher degree, he contended that he would in that case be entitled to it. Another man might have the recipe for the triple combination, but he could not avail himself of the other's knowledge, or use his discovery.

The LORD CHANCELLOR: Suppose I discovered a medicine to be made of red Peruvian bark, and took out a patent for the use of it in a bodily shape, to be applied to febrile diseases, and another chemist discovered it in the shape of quinine, would you say that he could patent his quinine in opposition to my bark powders for the same disease?

Mr. GROVE said, he apprehended that he could, for if a person was to stop at a particular stage, and it were to be said to him, "had it not been for my discovery, you would never have been able to have obtained your quinine," it would stop all subsequent inventions.

The LORD CHANCELLOR said, he was particularly struck with the case

of *Booth v. Kennard*, and he hoped Mr. Bovill would take particular notice of it in his reply.

Mr. GROVE said, the principal argument deduced from that was, that it applied to a mechanical and not to a chemical combination; and, if his learned friend in his reply should contend that certain mixtures were of a mechanical combination, that was not the sense in which the term was to be taken as used by chemists as a mechanical combination. He apprehended that where there was a separate and valuable discovery it might be allowed, although it had been obtained in a previous combination. When they looked at what was in the mind of the patentees, the case became a very strong one; one aimed at chloride of calcium, the other found some other production as extremely valuable: and here he must refer to the evidence of Mr. Campbell upon it:—

Mr. HINDMARCH: Have you also read Mr. Laming's specification of 1847?
Witness: I have read Mr. Laming's specification of 1847.
Mr. HINDMARCH: Did you read that part of it which describes the formation of chloride of calcium by means of muriate of iron?
Witness: I did.
Mr. HINDMARCH: If you put lime and muriate of iron together in a moist way, what would be the result?
Witness: You get a sort of slush, composed of chloride of calcium and protoxide of iron.
Mr. HINDMARCH: When you say a sort of slush, just tell me what you mean?
Witness: Chloride of calcium is one of those deliquescent substances—clammy, perhaps, is the name—one of those deliquescent substances which is always in a nasty moist state.
Baron BRAMWELL: Slush composed of chloride of calcium and protoxide of iron, you say?
Witness: Yes, my lord.
Mr. HINDMARCH: You say, it would be a sort of slush?
Witness: Yes.
Mr. HINDMARCH: Chloride of calcium is extremely deliquescent?
Witness: Chloride of calcium is extremely deliquescent.
Mr. HINDMARCH: Is it difficult to reduce it into a state of powder?
Witness: If you have a solution of it, it is extremely difficult to get it into a state of powder.
Mr. HINDMARCH: If it were mixed with oxide of iron, and gas passed through it, would it soon become deliquescent and moist again?
Witness: On exposure to the air, it would become moist again.
Mr. HINDMARCH: I see here something mentioned about the formation of the chloride of calcium by means of chalk and muriate of iron?
Witness: "Chalk or lime."
Baron BRAMWELL: What is the object of this? Is this to show that these are not hydrated oxides of iron?
Mr. HINDMARCH: No, my lord; there is another part of the description as to the formation of chloride of calcium by means of chalk, which cannot be done so as to produce a hydrated oxide. It is "chalk or lime."
Baron BRAMWELL: In plain words, a mixture of muriate of iron and chalk does not produce oxide of iron?
Witness: Not necessarily.
Mr. HINDMARCH: Not unless it is done in the moist state. If it is done in a furnace, it would necessarily be anhydrous oxide.

He was further examined upon it:—

Mr. HINDMARCH: You say that, if you make use of lime, instead of chalk, it may be done in the moist way?
Witness: It may be done in the moist way.
Mr. HINDMARCH: But, suppose you make use of the dry way, what would be the result?
Witness: It would be the same as with the chalk.
Mr. HINDMARCH: You mean, with regard to the state of the oxides?
Witness: With regard to the state of the oxides.
Mr. HINDMARCH: It would be an anhydrous oxide?
Witness: It would be an anhydrous peroxide, done in the dry way.

Mr. GROVE proceeded to say that Mr. Hills did not want to use chloride of calcium. If used in the dry way, it would not do; if used in the moist form, it was a slushy mess, and it could not be used with pleasure, as he could not drive the gas through the semi-pulverized matter. He considered it to be injurious, and did not want it. His lordship would see, as a proof of that, that Mr. Hills had disclaimed it. It was claimed by Mr. Laming, who had patented chloride of calcium; but Mr. Hills' discovery showed that it was an inefficient thing for the purification of sulphuretted hydrogen. He said he disclaimed it for two reasons—first, because it was bad; and, secondly, because it was Mr. Laming's recipe. He did not shrink from it. Mr. Hills had a right to disclaim that which was in a previous patent. That added to the argument he ventured to address to his lordship—that, although a combination, in one sense, might include a previous patent, it did not include a totally different thing, and Mr. Hills had shown that his was a separate thing; and, let Mr. Laming's patent be what it might, Mr. Hills said—"I do not want it, and I believe it to be injurious." Mr. Hills did not make his peroxide of iron by Mr. Laming's mode, and use it in conjunction with other things. There was a point which he wished to mention, and that was as regarded patents for what were called improvements. All cases previously cited referred to new inventions, and distinct subjects for new inventions. He excluded new patents; but were they certain in the case of the second patent, that it was inevitably a portion of the first, to make a cheaper combination, as was the case in that of *Tetley v. Easton*? Having referred to some other cases, the learned counsel said he held that Mr. Hills' patent was a good one, not as an improvement on Laming and Croll's, but as a substantial and new invention. It included hydrated oxide, which existed in Laming's patent as in combination with chloride of calcium, but as a separate thing when they came to the purification, as it did not produce the same results in the purification of gas. It differed in this view: that Mr. Laming did not see the applicability of oxide of iron to gas; but Mr. Hills did see it; and, therefore, he must take what was eliminated by different parties as not included. It might be like the case of the quinine put by his lordship. Although the bark would make the medicine, it assumed a totally different character when extracted from the bark. When eliminated, it became a separate thing; and, although the mode of using the one included the other thing, which previously existed, it was new as to its application; and that made the difference between a new thing, and a new application.

The LORD CHANCELLOR said, suppose the patent to be put in the category of vehicles for the application of hydrated oxide, would a chemist be able to say to any one that Mr. Hills' patent would be the proper one?

Mr. GROVE said he would read what was said upon it in Laming's patent:—

Another part of my invention is an improvement or improvements in the manner of using chloride of calcium for the purification of coal-gas. I do not claim the use of that re-agent in a dry state, nor when it is in a fluid condition. Both these ways are attended by inconvenience. In the one case, fluids cause objectionable pressure on the retorts; and, in the other case, dry chloride of calcium desiccates the gas, and thereby causes it to deposit naphthaline. I avoid both these evils by mixing the powered chloride with sawdust, or other convenient and absorbent matter, and then sprinkling the mixture with water, until it becomes very damp or wet; or, which is still better, by causing a strong solution of the chloride in water to be absorbed into dry sawdust, or other convenient matter, in such proportions as to confer upon the mass the form of a wet and granulated powder.
I claim the use of chloride of calcium, prepared in either of these ways, for the purification of coal-gas, and I use it in the manner in common use for hydrate of lime.
I claim also the use of muriates and sulphates of manganese, iron, and zinc, prepared by absorbing a strong solution of those salts respectively into sawdust, as explained with respect to chloride of calcium; but I do not claim the use of either of the aforesaid metallic salts in a fluid state, or in a state of mechanical division and wetted, even though they be mixed with sawdust. In addition to the objectionable pressure caused by all fluids, metallic solutions in particular obstruct the purifying apparatus by letting fall heavy precipitates; and the more mechanical divisions of a metallic salt, such as sulphate of iron, leaves in the centre of each fragment, however small it be, a quantity of the re-agent, on which the impurities in the gas can hardly be made to act. Chloride of calcium is both abundant and cheap; under certain circumstances, it may, however, be desirable to make it for the purposes of of gas-purifying, by decomposing muriate of manganese, iron, or zinc, by means of lime, or of chalk, when the latter will suffice. In such cases, the oxides or carbonates which result are useful for the said purification, and need not be removed.

The whole of that passage in Laming's specification could be anticipated by Hills' specification.

The LORD CHANCELLOR: What do you understand by the words, "I claim the application of the mixtures so made to the purification of coal-gas?" Does that mean the decomposition of muriate of iron by lime?

Mr. GROVE said, he should take the whole of the muriates of iron and zinc; but he objected to the last phrase—"I claim the application," not the mode of making; which meant that the mode of making it was old.

The LORD CHANCELLOR: I want to know the meaning of the word "mixtures." You hold that it meant various mixtures.

Mr. GROVE said, yes; to the various mixtures included in that paragraph: and Baron Bramwell adopted the reading which he (Mr. Grove) had put upon it. He assumed that he meant the mixture of manganese, iron, or zinc, with the chloride of calcium. He said he would take chloride of calcium *simpliciter*, with the accidental adjuncts that might be got from its manufacture. The whole of what he claimed in the specification for the purification of gas was chloride of calcium, but they got incidentally the benefit of other things; as there was abundant evidence to show that Laming's plan was inefficient.

The LORD CHANCELLOR said, Mr. Bovill had contended that these mixtures were not to be taken as incidentally, or as oxides, or carbonates alone, but must be taken as mixtures of chloride of calcium, with something else. Then, there was nothing in that part of Mr. Laming's specification which at all indicated the discovery of Mr. Hills, except that oxides were useful for purification, and need not be removed.

Mr. GROVE said he followed his lordship, but, as he gathered from the specification, there was only one other part which applied to Mr. Hills, and that was in regard to sulphate of ammonia, and the process to make certain carbonates. Neither claimed the making of the chloride of calcium. Mr. Hills said he made peroxide by his process, but that he did not want carbonates at all.

The LORD CHANCELLOR said, he thought on Saturday to the result and the substance produced there was no opposition, that it was a carbonate, which by another and distinct thing became an oxide.

Mr. GROVE said that was not so; and he was going to show, by the evidence for the plaintiff, that the mixtures which Mr. Laming claimed as oxides which were useful and ought not to be removed, were inefficient mixtures for the purification of gas generally:—

Mr. HINDMARCH: When the hydrated protoxide is produced in this way, do you get it alone, or is it mixed with some other material?
Witness: It contains a mixture of chloride of calcium and protoxide of iron.
Baron BRAMWELL: The two are mixed together?
Witness: The two are mixed together, my lord.
Mr. HINDMARCH: In that state, is it an effective agent for the purification of gas?

Mr. GROVE said that with chalk it could only be done in a dry state, as chalk was an insoluble matter, and it would remain as chalk to the end of time, and he should also be prepared to show that it was quite inefficacious for the purification of gas.

The LORD CHANCELLOR: Mr. Laming said he got chloride of calcium in this way, and mixed it with something else, and what was so mixed with it need not be removed.

Mr. GROVE: That is the undoubted construction of Laming's patent.

The LORD CHANCELLOR said, that Mr. Grove had observed on all the other parts of the specification, except one which described how chloride of calcium was to be made in the most economical manner, and in the residuum oxide of iron would be formed. That was not, primarily, an oxide, but a sulphuret, and then it became an oxide by the subsequent agency of the atmosphere.

Mr. GROVE said, before he parted from the passage as to oxides, which need not be removed, he must say that he used the term in the most general form; he spoke of one oxide in particular, manganese, and that was anhydrous.

The LORD CHANCELLOR: His language is applicable to oxides generally He uses a word which will include both oxides, hydrated and anhydrous.

Mr. GROVE said, it did not go quite so far as that. Laming had used the liquid way rather than the dry way, but he (Mr. Grove) said that the liquid way was inefficient, and would not do, and, Mr. Clark, a gas engineer, with twenty-five years' experience, in answer to the Attorney-General said, he had tried several processes, and with different quantities of the same materials, but they all failed to purify the gas practically: they would do so to a small extent, but to a very small extent.

The LORD CHANCELLOR: Give me references to one or two pages, to show how these results may be obtained in the most economical manner.

Mr. GROVE said, he would direct his lordship to a passage at the bottom of page 83:—

Baron BRAMWELL: Stop! I thought Mr. Hindmarch first began by asking you this question. What is the result if the process described in page 5 is adopted?
Witness: You get sulphuret of iron and carbonate of iron. In one case, you have to remove the sulphuret, and, in the other case, you may not remove it, and thereby you get a mixture of the two—in the one case, you get the carbonate only, and, in the other case, you may not; by following that process, you may either get carbonate of iron *per se*, or you may get carbonate and sulphuret of iron mixed together.
Mr. HINDMARCH: "I throw down from ammoniacal or gas liquor, obtained in the making of coal-gas, and previously distilled or not, the sulphur which it contains." Suppose you have done that, and you proceed as here described: "Having drawn off the clear, I next precipitate the carbonic acid, or, instead of making two separate precipitates, I throw down a mixed sulphuret and carbonate of the precipitant or precipitants." Then, he says, "I prefer to precipitate by means of a muriate or sulphate of iron." Now, suppose you first get rid of the sulphuret, and then apply the muriate of iron to the gas-liquor, what is the result?
Witness: Carbonate of the protoxide of iron; a white substance—a white precipitate.
Mr. HINDMARCH: Is that the same as hydrated oxide or not?
Witness: It is not.
Mr. HINDMARCH: Will it effect the same purpose—the purification of gas?
Witness: My experiments point out that it will not.
Mr. HINDMARCH: Have you tried it?
Witness: I have tried it. It does purify gas to a very slight extent; but it would be valueless, comparatively speaking, in the purification of gas. I can give you the data, but it is very trifling.

The LORD CHANCELLOR: Do you deny that carbonate of iron will purify gas?

Mr. GROVE: We say that it is a very inefficient agent, and our witnesses say so.

The LORD CHANCELLOR: And that carbonate of iron will not become hydrated?

Mr. GROVE said, it might become so, but that was not what Mr. Laming was aiming at. They said that it would liberate the carbonic acid, which would go off with the gas, and would be injurious. It was an assumption that, having got hydrated oxide, it might be revivified and changed, and so get another substance, but Mr. Laming did not point that out in his specification.

The LORD CHANCELLOR wished to know, if the process was carried on and exhausted to the residuum, whether that would be applicable to the purification of gas?

Mr. GROVE said, it would be stopped in the process; but Mr. Hills says: "I can make my carbonate of gas-liquor. Gas-liquor is carbonate of ammonia and sulphuret of ammonia. If I put the salt of iron to that, it will throw down the sulphuret of iron and the carbonate of iron, not oxide of iron." Mr. Bovill had endeavoured to show, that under Mr. Laming's patent, that the carbonate, when exposed to the air, became an oxide, and, therefore, that Mr. Laming's patent had anticipated that of Mr. Hills; but, at the trial, Baron Bramwell said there was nothing in that. In his specification, he said:—

To obtain these carbonates in an economical manner, I throw down, from ammoniacal or gas-liquor obtained in making, coal-gas, and, previously distilled or not, the sulphur which it contains; and, having drawn off the clear liquid, I next precipitate its carbonic acid, or, instead, of making two separate precipitates, I throw down a mixed sulphuret and carbonate of the precipitant or precipitants.

The LORD CHANCELLOR asked for some further explanation on this point.

Mr. GROVE said he would show it by the evidence of Dr. Taylor:—

Mr. BOVILL: Does gas-liquor contain a considerable portion of hydrosulphuret of ammonia?

Witness: It does.

Mr. BOVILL: Is hydrosulphuret of ammonia a useful agent, in connexion with muriate of iron, in precipitating hydrated oxide?

Witness: No; I should not select it for that purpose.

Mr. BOVILL: Will it do?

Witness: It will do—it may do.

Mr. BOVILL: The gas liquor containing hydrosulphuret of ammonia, used in connexion with the muriate of iron, would act as a precipitant of the iron?

Witness: It would throw down the sulphuret ot iron; it would not throw down the hydrated peroxide of iron; it would throw down the sulphuret of iron.

Mr. BOVILL: And then it would become hydrated oxide by exposure to the air?

Witness: Yes.

There were many other passages, but there was no dispute of facts but as to the application of carbonates. He would follow on that by some other evidence:—

Mr. BOVILL: If it is moved about?

Witness: Every little particle must be exposed, or else the hydrated would be outside, and the sulphuretted would be inside; that would be the proper way of working it.

Mr. BOVILL: Unless it was moved about, only a portion of it would be converted into the hydrated oxide?

Witness: Certainly; only a portion.

Therefore, it would be found that the presence of oxide was merely in an incidental form, and there was no proof that Laming claimed it as chloride of calcium; and the mixture so made, according to the plaintiff, was inefficient. Another part on which he could have relied was, that which was contained in page 6 of his specification; but, as he had made such alterations in his specification, there was a difficulty in seeing what he really claimed, but there was no difficulty in seeing what he meant by his disclaimer. He said:—

Another part of my invention, consists in increasing the purifying powers of the aforesaid preparation of chloride of calcium, or chloride of calcium and metallic oxide, or chloride of calcium and metallic carbonate, and also of the aforesaid metallic salts, absorbed in solution into sawdust, by adding thereto oxide of manganese, iron, zinc, or lead, obtained in a proper state from any other economical source.

He (Mr Grove) did not know what the words "the aforesaid preparations' meant, because part of the process was thrown on the oxides, and, therefore, it must mean powdered chloride with sawdust. He said, another part of his invention was the preparation of chloride of calcium, and the use of metallic oxides, obtained from the most economical source, and that was important to show that he contended using them in a dry state. He went on to say:—

The oxide I prefer, is the oxide of manganese, and prepared according to a process for which I claim the application.

What formed the substantial part? He said:—

I expose the carbonate to a heat, gradually increased to near redness, with access of air for an hour or two, until the carbonic acid be expelled, and oxygen absorbed in its place. If, in this process, the carbonate of manganese be contaminated with sulphur, or if the vegetable matter be present, and it ignite, or if the heat be very great, and too suddenly applied, or if the molecules or carbonates be enveloped by soluble matter, then, only a red or brown oxide results; but, in the absence of all these impediments, so much oxygen combines with the manganese as to convert it into the black or peroxide.

The beginning of the passage was what he had disclaimed. What a totally different meaning the specification then assumed! In the next passage, he spoke of materials "obtained in a proper state," but, as he had disclaimed the whole of that passage, it had no meaning at all. The words were intelligible when the passage existed in the specification, but it was unintelligible when the passage was removed. Without the passage, no chemist could tell what Mr. Laming meant by "a proper state." It seemed here as it was with Mr. Croll, that the one great point they had, in their heads, was in the application of heat. Both Laming and Croll seemed to think that they could burn away the sulphur and vegetable matter, and so get an oxide or carbonate which they could use again.

The LORD CHANCELLOR said, he was not much struck by the passage in which he found some agent had to be used in combination with chloride of calcium to increase the purifying power of the chloride of calcium. He found a number of things in the preparation of the carbonate, and he proceeded to describe how they were to be prepared, whether they were to get hydrated or anhydrous oxide, to be used in combination, and to increase the purifying power of chloride of calcium; and he must say what a vexation it was to him not to find any rule laid down which should define the amount of precise and specific information as to a previous patent that should annul a subsequent patent. There ought to be some rule of law to be applied to such cases, and the amount of information might prevent the granting of subsequent patents.

Mr. GROVE said, it was a question for the jury, whether there had been any public user under the specification? And the test of what was a sufficient publication was, did it disclose sufficient information, and put the public in possession of the thing, without an experiment?

The LORD CHANCELLOR said, he wanted the learned gentleman to show him the expression which would warrant it. Was the specification so definite that an ordinary workman could make the thing described, and apply it to science, and was the previous specification so precise that an ordinary person could at once detect the exact thing?

Mr. GROVE said, he did seek to go so far as that; but, was that a proper specification to instruct an ordinary workman to use the recipe prescribed? He would so far admit it, but he would not go into that amount of detail to enable a mere workman to do it. All that was required in the specification was the nature of the invention, so that a competent man could understand it; and not apply to it genius or the inventive faculties. If they took a book which required the understanding of a Bacon or a Newton, then they might find some passage which would anticipate every patent. As to Laming's patent, he did not claim the use of metallic oxides; but, what he did claim was, in the combination of iron, zinc, or manganese, and Mr. Hills disclaimed the use of them in combination; and, as to chloride of calcium, he said he did not want it.

The LORD CHANCELLOR: Suppose I read, in a medical work, that the combination of calomel, antimony, and rhubarb, would be a specific for a particular disease—suppose I took out a patent for it, and compounded the medicine; but, in the specification, I gave the exact relative proportions, and the proper dose of medicine, would my patent be anticipated by the anterior information?

Mr. GROVE: That would be for the jury. The learned counsel then proceeded to cite several cases in support of his argument, and said that an abstract rule was not more difficult than a general rule; but this question did not lie on any rule, but on the application of it. In reference to the case of *Collins v. Muntz*, cited by his learned friend, the essence of that invention was in the alloy in the copper, which had peculiar effect in resisting barnacles on the bottoms of ships; and the case depended on the purity of the copper that was to be used, and which constituted the ground upon which the second patent was held to be good. In the argument on the case of *Speed v. Anderson*, it was held that ignorance of a former patent was no excuse or justification for the infringement of that patent; and, as one of the judges had described it: if that were so, patents would only be given to ignorance, and not to those who were advanced in human knowledge.

The LORD CHANCELLOR said, what was public property could not be taken out of the common stock of knowledge, and could not be applied to private monopoly.

Mr. GROVE, having again adverted to the case of Muntz, said that the patent rested on the peculiar quality of the copper to be applied; but it was impossible that the public could get the best material if they followed Laming and Croll, and they would and must use something else. His learned friend had not gone mainly into the question; but they must look to some real broad question in the specification which disclosed Croll's patent. Did he rest on the roasting? If they did, Laming roasted his chloride of calcium. Mr. Hills said he found peroxide of iron, and he rested on that, as he did not interfere with previous patents. Croll roasted his manganese, and Laming used his chloride of calcium, but Hills said the peroxide of iron and the revivifying of it was a new discovery; and it was ungenerous on the part of men who were called as witnesses, having the whole knowledge of Mr. Hills' specification before them, to endeavour to get rid of Hills' patent. Having referred to the opinions of the judges in the House of Lords, in the case of *Heath v. Unwin*, he said that Baron Parke observed in that case, that the specification must be read by persons acquainted with the subject; and, as it was made known to persons at the time, Chief Baron Pollock said that strictly nothing was protected by the patent that was not expressed in the specification, and was only to that which was communicated to the public in his specification. He next referred to a very remarkable case—that of *Seed v. Higgins*—which was a patent for a peculiar description of flyers used in machinery for weaving and roving cotton and other fibrous substances; but Lord Campbell would not allow the evidence tendered for the defendant to be inserted. For the information of his lordship, he would read the marginal note in that case:—

Patentee claimed by his specification the application of a principle of centrifugal force in the flyers employed in certain machinery for roving cotton and other fibrous substances, but declared that his improvements apply solely to such part of the machinery called the flyers, which is employed in connexion with the spindle, for the purpose of winding cotton, &c. He attached drawings to his specification, and went on to say, these drawings and the specification represented one particular and practicable mode of applying his invention: "But I do not intend to confine myself to this particular mode, but I claim as my invention the application of the law or principle of centrifugal force, the particular or special purpose above set forth, that is to flyers used in machinery for preparing cotton." He afterwards disclaimed all application of the law or principle of centrifugal force, "as being part of my said invention contained in the said specification, except only the application of centrifugal force by means of a weight acting on a presser so as to cause it to press against a bobbin, as described in the specification." He held that this disclaimer did not extend the claim, but confined it to a particular mode of applying the principle of centrifugal force, and he did not claim the discovery of that principle, or the application of it, except in a particular way, and that, therefore, the patent was good. He held also that, as the defendants applied it in a different way, their machine was not an infringement; and further, that the judge at the trial, on seeing the difference between the two machines, ought to have told the jury there was no evidence of infringement.

That verdict was not disturbed. In that case, the judge and jury were in his (Mr. Grove's) favour, and, as to questions of fact, whether they were or were not matters of inquiry for the jury, right or wrong, that part of the case had been disposed of. The only ground which was the subject of appeal were errors in point of law. Applying to the question that his learned friend was satisfied that the jury was wrong, that would not help him. Then, there was another point which had been almost abandoned, as the whole could have been brought before the Court of Error, on the argument taken as Hills' specification as to hydrated or precipitated oxides. He contended that Mr. Hills could not use better words to indicate a class of things known, but not known as applicable to the purification of gas, and, as events turned out, singularly well understood. If he (Mr. Grove) had to draw a specification for Mr. Hills *de novo*, he knew of no better words he could use than oxide of iron, hydrated and precipitated—not anhydrous, for then they would get rid of the word "hydrated;" it was not anhydrous, and they got rid of that by using the word "precipitated," and he might then say that any class of oxides which are not hydrated or precipitated were beyond his patent. Precipitated oxides were all hydrated, but all precipitated oxides were not hydrated, but it sufficiently indicated the class which Mr. Hills required. He was going into unnecessary details as to Mr. Hills' patent, but his specification was so conspicuous as not to require all possible exclusion. All that was required was to point out to the reader the nature of the invention, and carefully to lay it before the public. He (Mr. Grove) contended that his

specification indicated sufficiently what he meant by those oxides. In his specification, he says:—

My mode of obtaining certain substances applicable to purifying gas consists of a method of making the precipitated oxides and subsulphates of iron. To prepare the hydrated or precipitated oxides and subsulphates of iron, I take the precipitated sulphuret of iron, obtained in any convenient way, and mix them with, or absorb them into sawdust, breeze, or other porous material, and then expose the material so made to the air, to absorb oxygen, whereby the oxide and subsulphate of iron are obtained.

Here was an irresistible argument as to the class of oxides he intended to use. He might have said precipitated oxides, but persons might then have said that it only meant oxides that were anhydrous; so, to remove all objections, he used the words, "hydrated or precipitated," which showed clearly what it was to be, that it was to be hydrated or precipitated, and not native oxides, as they could not, in any sense, be called precipitated. He did not necessarily confine himself to artificial oxides, but they must be precipitated. His lordship would observe that streams of water ran out of mines, and, where the water passed through, were found oxides of iron. The iron rusted by the carbonic acid; the action went on, and it precipitated the oxide. No chemist would have made any mistake as to what Mr. Hills meant, whether formed in the way Mr. Hills pointed out, or in any otherway. Mr. Hills gave a process for making a precipitated oxide, and all that was to be done was to make the particular class of oxides he claims, showing to any man who did not really wish to be misinformed what his process really was. He gave, for instance:—

I take the precipitated sulphurets of iron, obtained in any convenient way, and mix them with, or absorb them in, sawdust, breeze, or other porous material, and then expose the material so made to the air to absorb oxygen, whereby the oxide and subsulphate of iron are obtained.

He used those words to show how he obtained the materials he claimed as the first to be applied to gas-purification, and then he went on to say, that they might either use them alone or mixed with sawdust, breeze, or other porous material; but he said:—

I do not claim peroxides of iron mixed with chloride of calcium, or with the muriates and sulphates of manganese, iron, zinc, and absorbed into sawdust, &c.

Mr. Hills there had no view of Mr. Laming's patent when he said he claimed no mixture, whatever it is worth. That was a strong question of fact. The testimony was not disputed; and they produced evidence on both sides to say that Laming, having got his invention before Mr. Hills, gave it up, and did not use it. He claimed alone the mixture of certain materials; he claimed the renovation of the purifying materials, but he disclaimed the mixture of chloride of calcium. Had not Mr. Hills appropriately described his invention, and the means of carrying it into effect? He (Mr. Grove) had not heard his learned friend urge that words more applicable might have been used by Mr. Hills than precipitated oxide by precipitation, and not those produced by nature.

The Lord Chancellor: Does not your argument strike out the disjunctive word "or?"

Mr. Grove said, he did not think so, as it directed the public to use oxides in a precipitated state. The words were not intended to be read by the eye of a special pleader, but were intended to be taken together in the specification, as indicating a well-known class of oxides.

The Lord Chancellor said, the other day he was inclined to be of that opinion, but he understood him then to say that the specification included artificial oxides; but now, he said it was not to be confined to oxides that were artificial.

Mr. Grove said, they were artificial in a certain sense, and were known to chemists as artificial oxides; but they were known to be produced in the same way by nature as by man. The question might arise, if a person were to take as identical in all senses, that all oxides mentioned by Mr. Hills were artificial when made by nature in the same way as made by man. If the word "artificial" was substituted, then his learned friend would say that it was not within the specification.

The Lord Chancellor: Suppose a stream of water should run through a vein of iron, and that should acquire certain qualities, should you denominate what is produced from that as an artificial thing?

Mr. Grove said, he should; but it was not necessary for him to go to that length, although Mr. Hills generally referred to things that are artificial.

The Lord Chancellor said, if they took the words in their common, general meaning, hydrated and precipitated—one set on one side, and one on the other—hydrated was one class, and precipitated another; if that was so, it involved a difficulty. Inasmuch as the patent contained a true and correct assertion as to what oxides would effect, it seemed that the word "hydrated" might be taken as to what it would do, in contradistinction to what anhydrous would not do.

Mr. Grove said, the whole specification would be clear when read by a chemical person. As to the word "or," it was as often used in a conjunctive as in a disjunctive sense. It gave the mode of manufacture, and drew a distinction between hydrated and anhydrous oxide. It did not mean hydrated oxide as precipitated oxide. It might be said that hydrated precipitated oxide would have expressed the meaning.

The Lord Chancellor said, it might refer to some oxides that were hydrous, but not anhydrous.

Mr. Grove said, that could not be, and he contended that the specification was perfect in its language, and such as a person reading it would understand as its meaning. He put it that all precipitated oxides were artificial, but nature did, in certain instances, make some by combination herself. He said, looking at the specification, it was clear that Mr. Hills could not have meant to use the word "or" in a disjunctive sense, but consistently with the ordinary idiom of the English language; and that there was strong evidence of it, and they were not to take the legal mode of scanning a document, but to take it that the patentee meant precipitated or artificial oxide. The terms were well known to chemists, but not their application, that hydrated oxide of iron would absorb sulphuretted hydrogen; and, therefore, the indication, to those who were acquainted with the subject, was clear. Did that fairly disclose to chemists what Mr. Hills proposed? It would be impossible to conceive what term would cover incidental things as found in nature, which did artificial things in certain instances. The patentee had not used any inaccuracy to mislead the parties whom he addressed; but, if so, was the inaccuracy so great that no one could find out Mr. Hills' patent from his specification? Were they to say that the chemists who read it must have gone and taken the native oxide? In dealing with Mr. Hills' patent, the question was not—Whether oxide of iron had an affinity for sulpher? but, Whether it would efficiently purify gas?

The Lord Chancellor said, that chemists had discovered that hydrated oxide of iron had an affinity for sulphur, and superadded to that was Heard's patent, that it was to be applied to sulphuretted hydrogen.

Mr. Grove said, that Heard did not tell them that, but he told them that lime would purify gas, and went on to say that metals or their oxides would do so. Applying to Mr. Bovill's argument up to that point, it was in his (Mr. Grove's) favour, and the Court of Exchequer arrived at the conclusion that it meant all hydrates as were precipitated. The whole specification had regard to one class of oxides; and, although Mr. Hill's had used the word "or," courts of law had frequently held that the word "or" might be construed as the word "and."

The Lord Chancellor said, that would depend upon the sense of the passage; and he must say that he had a good deal of difficulty in following the conclusion of the Court of Exchequer on that point.

Mr. Grove said, there was not the same attention paid to that mode of expression there as before his lordship; but, regard was had to the patent, and the Court of Exchequer, taking the whole of the specification, held that it would not unreasonably be so understood by a chemist.

The Lord Chancellor: Every instance he gave was an instance of precipitated oxide.

Mr. Grove said, that all precipitated oxides were precipitated, but all native oxides were not precipitated. The oxides which Mr. Hills employed were largely and substantially artificial, and he (Mr. Grove) would admit that they were sometimes found in nature; but, when so found, nature employed the same means as were used artificially. Mr. Hills, however, was not tied down to artificial oxides, because nature sometimes—if he might be allowed to use such an expression—imitated the process which was taken by man.

The Lord Chancellor said, it was a question whether they could take the words all hydrated oxides, or all precipitated oxides being artificial.

Mr. Grove said, he could not take that to his own mind. The Court of Exchequer used the word "artificial," as far as it went, correctly, when broadly speaking of oxides, but, the technical word would have been precipitated, and it was held that it would do if, in Mr. Hills specification, the word "hydrated" had been omitted. Mr. Hills wished to intimate that he did not want to get native, nor did he want to get anhydrous oxide. If Mr. Hills said that precipitated oxides were all he claimed, he would use oxides such as were precipitated, but he would add that they must take care always to use them in a hydrated state.

The Lord Chancellor here remarked that, he had observed there had been great public disadvantage during the course of these proceedings, and even there were grounds as to the mode which was pursued at the trial, as he had observed that Mr. Bovill had put questions to the chemists as to whether they had been retained. He understood that it was the practice to go to chemists and give them a retaining fee, in order to become witnesses at the trial; but, if he had a chemist to be examined, he should not pay the least attention to the evidence of a man who had hired himself antecedently to the trial to the parties who would call him as a witness. Should such witnesses come before him to be examined, he should not pay any attention to the evidence on behalf of the person who had hired him to give evidence in his favour. He believed that it was a common thing for a patentee to go to a chemist and give him a retaining fee of ten guineas as his witness at the trial, for the purpose of obtaining his evidence in his favour, and, if that was true, it was a practice that could not be too strongly condemned.

Mr. Grove could say, on Mr. Hills' behalf, that he had not done so.

The Lord Chancellor said, he did not know what might have been done in this case; but, if witnesses should come before him, he would take an opportunity of ascertaining if that was a fact.

Mr. Grove said, there was a class of expert evidence, which led sometimes to the perversion of the truth. Scientific witnesses having got their minds attracted to one side, saw one colour on one side of the shield, and on the other side another. Proceeding with his argument, he said he would venture to submit that he did not know a single witness for the plaintiff or the defendant who said, on the face of the specification, that it did not indicate to any person acquainted with the subject—that it did not reasonably indicate—what Mr. Hills intended by the words, "hydrated or precipitated oxides." It was manifest that the patent was not shaken by the ungrammatical use of the word "or," and was unanswerable as against Mr. Hills, although he had used a word which did not comply with a strict grammatical construction. He believed that he had now met all the arguments of his friend, Mr. Bovill; but, before he sat down, he would ask his lordship to look to the case, and see, in reference to the patentee, whether his specification did not sufficiently indicate and describe his invention, and the means for carrying it into effect—not to be read and criticised as a document by lawyers, but giving a strict and peculiar meaning? In reading the language of the patentee, if there was a mere mistake, and that was a mistake only in a single instance, he would refer to the case of *Beard v. Egerton*, in the Common Pleas, when the court upheld the specification against the common and express meaning of the word; for, had the pumice-stone been applied in the way directed, it would have rubbed off the iodine from the surface of the plate; and, therefore, as the words could not be explained, the court said it must be erroneous, and that the specification must be read as by a party anxious to follow, and not criticise or find fault with it. He trusted his lordship, looking at the specification, would say that neither Heard, Croll, nor Laming, had possession of the invention of Mr. Hills; and, having again referred to the question as left to the jury, he hoped he would declare that Mr. Hills's was a good patent, and ought to be maintained.

Tuesday, Jan. 21.

Mr. Hindmarch, in following upon the same side, said he felt he had been relieved from considering the question of Heard's patent, but he did not know how far, as it had been said in his time, the difference between the two oxides was unknown. He had looked into the largest dictionary, and he found in Bacon no word about hydrated oxide. He then came down to a more recent book, which was that of Gale's, and in that he found nothing about hydrated oxide. All that could be said upon this subject was said by his learned friend at the trial; and it was said that hydrated oxide was not then known to men of science and skill, and, therefore, the specification of Heard in 1806 must, according to the rule laid down in many cases before the House of Lords, be construed according to the knowledge in existence of persons in reference to the subject to which it related.

The Lord Chancellor: Not quite. I cannot concur with you, that the specification is to be construed altogether according to the state of knowledge at the time. That was Mr. Bovill's argument, and I warn you against conceding it.

Mr. Hindmarch said, he submitted that the case of *Unwin v. Heath* clearly laid down the rule as to specifications of this description, that they must be construed according to the knowledge in existence at the date of the document. His lordship would remember, in a case before the House of Lords, that it was held where a thing was unknown to chemists at the date of the specification, that it was not an infringement of the patent. It was decided by the House of Lords that it could not be taken as having been published to the world, if it was not known to the chemists of the period. Lord Brougham, in giving his opinion upon it, said they should do violence

to the subject if they were to hold that this document could be construed in reference to something which was published to the world afterwards. How could any one be presumed to know if it had no existence so far as the knowledge of the world was concerned, and in construing a document they had to consider what the person who wrote it intended, and the knowledge he had in his mind at the time he wrote it? If that were so, this document must be construed in the way he (Mr. Hindmarch) had described—that he had no knowledge of the difference between hydrated oxide of iron and oxide of iron at the time of his patent. All that followed was, that the writer supposed that other things would produce the same thing as lime; but he had never used it, and he merely said he concluded those things would produce the same results as lime. He classed all those things together, as having the same quality; and it was evident from the accidental way in which he spoke, that he used to consider them as inferior to lime. Having used it, he came to iron, manganese, sulphur, zinc; he suggested that they might be used for the purification of gas instead of lime; but this specification did not carry the want of novelty in Mr. Hills' patent one jot further than Mr. Croll's specification. Now let him consider what the effects of their publication were. He must advert to something which Mr. Bovill said in his opening speech in reference to the Court of Exchequer. He said that he had been confined in his argument by the strict rule to considering only the points of law in the case. Now, that course was taken with his learned friend's assent. Then, what could he complain of in not being allowed to travel through the whole of the facts of the case, controverted and not controverted, and shape them to suit his arguments at the time. That was what he was doing before his lordship, and let them see what was the main argument on which nearly the whole of his speech was based for the purpose of destroying Mr. Hills' patent. He said it was known before the date of this patent that oxide of iron would destroy sulphuretted hydrogen. His learned friend's argument was that it was published that oxide of iron would purify gas.

The LORD CHANCELLOR remarked, that Mr. Bovill had said, at the date of Croll's patent, it was supposed that anhydrous oxide would not absorb sulphuretted hydrogen, and, in support of that, he referred to Dr. Taylor's evidence, who said, that down to 1840, it was not known that anhydrous oxide would absorb sulphuretted hydrogen.

Mr. HINDMARCH said, the evidence of Dr. Taylor was, that he did not think that it was known that hydrated oxide would absorb sulphuretted hydrogen; but, it was known that anhydrous oxide would not absorb sulphuretted hydrogen, unless heated to a high temperature. His lordship would, therefore, see that the witness made a clear distinction between anhydrous oxide as applied to sulphuretted hydrogen, and used in connexion with gas. The witness, then, went on to say that he had tried all, and found all would purify to some extent, but Mr. Hills had, himself, made use of a material for purifying gas so effectually that all the sulphuretted hydrogen should be taken out of it. The witness might well say that the anhydrous oxide would not do so, as its affinity for sulphur was not so great as to completely purify it while passing through the receiver. Dr. Frankland and Dr. Miller said that they agreed, and confirmed all that Mr. Campbell had stated. It was clear, also, he did not mean what his learned friend said he did, because, when the question was put to him, he said he agreed in the evidence of Dr. Campbell, that anhydrous oxide would not absorb sulphur. With respect to matters of fact being excluded, his learned friend had no ground to complain; for, at the conclusion of the case, he got up and suggested that there should be a nonsuit.

The LORD CHANCELLOR said, it was not necessary for him to go into the facts urged at the trial, but, whether in consequence of other inventions, Mr. Hills' patent was invalid?

Mr. HINDMARCH said, he was only going to call his lordship's attention to a few cases.

The LORD CHANCELLOR said, that every part of the evidence that was disputed, might be considered as decided by the jury; but, as to the particular thing described in Croll's and Laming's patents, the inquiry as to the reading of the three documents, was not before the jury.

Mr. HINDMARCH said, at the trial, the meaning of the term "oxide" was admitted to include hydrated and anhydrous, and it then became of importance to ascertain, having regard to the process described, and the light of the evidence, whether the fact had been published to the world, and that it was in reference to hydrated oxide of iron? The learned judge left that question to the jury in the only way in which he could leave it, on the question whether the word "oxide," considering the knowledge of the time, would mean hydrated or anhydrous oxide? Did that indicate to the mind that hydrated oxide was intended to be used? That was the way in which the question was put, and Mr. Bovill took no exception to it, and, when he applied *nisi* for a new trial, he took no exception, and his lordship would not find a single word as to misdirection at the trial. Throughout the whole of the discussion, it was almost impossible to ascertain what were the admitted facts. All that Mr. Bovill prayed in aid of Laming's patent was gone, for it had been taken from him by the verdict of the jury. In construing the specification, the only question was, as to what the man meant who drew it, and that could not be affected by any subsequent knowledge. His learned friend had had the opportunity of submitting questions of fact to the proper tribunal, and that tribunal had decided against him.

The LORD CHANCELLOR said, Mr. Bovill's argument was, that Mr. Hills' patent had been anticipated by three previous specifications, and it limited itself to that view, in which argument he entirely concurred.

Mr. HINDMARCH said, the Court of Exchequer, in considering the case, excluded all the facts, because they had been settled by the jury; but his learned friend wished to bring in aid the evidence of scientific men in considering points of law. His lordship would find that in the Court of Exchequer Mr. Bovill was told that all disputed points not agreed upon were concluded by the verdict of the jury, and that all other processes must be taken to apply to anhydrous, and not hydrated oxide of iron. As to Croll's specification, he would not call his lordship's attention to the evidence, except as regarded one thing. His lordship would find that Croll described first manganese as a purifier, but he omitted the agreement on all sides that the roasting of manganese would necessarily make it anhydrous. Mr. Laming claimed chloride of calcium, but Mr. Hills disclaimed it, and only claimed anhydrous oxide; and yet his learned friend said, that Mr. Laming must be taken to have claimed it.

The LORD CHANCELLOR asked to have some passages in the specifications read.

Mr. HINDMARCH observed that Mr. Laming said in his specification:—

> Chloride of calcium is both abundant and cheap; under certain circumstances, it may, however, be desirable to make it for the purpose of gas-purifying, by decomposing muriate of manganese, iron, or zinc, by means of lime, or of chalk, when the latter will suffice. In such cases, the oxides or carbonates which result are useful for the said purification, and need not be removed.

The witnesses for the defendant had admitted, however, that the reference of that passage as to carbonates was a mistake. He then went on to say:—

> I do not claim either of these processes for making a mixture of chloride of calcium and a metallic oxide or carbonate, but I do claim the application of the mixtures so made to the purification of coal-gas.

The LORD CHANCELLOR: Now, go to the passage in Hills' specification.

Mr. HINDMARCH read:—

> My improvement for the purification consists of a method of purifying in the following manner:—I take the hydrated or precipitated oxides of iron either by themselves, or mixed with sulphate of lime, sulphate or muriate of magnesia, baryta, strontia, potash, or soda.

Now, it is alleged that, if he took those processes, the result would be that of Laming's patent. His learned friend said, clearly that would be an infringement of Laming's patent.

The LORD CHANCELLOR asked if there was any evidence to show in what way the chloride of calcium got rid of hydrogen?

Mr. HINDMARCH said Mr. Laming's process was tried at gas-works in the winter time, and it was found that the chloride of calcium would not purify gas.

The LORD CHANCELLOR: When the muriate of iron was mixed with lime, might it then be used for the purification of gas?

Mr. HINDMARCH said, Mr. Laming had told them to put chloride of calcium among breeze, &c., and that the oxide would be absorbed; but Mr. Hills told them nothing of the kind.

The LORD CHANCELLOR said, it seemed, if they united muriate of iron with lime, it would be precipitated to the bottom of the vessel, whereas chloride of calcium would be the fluid that would supervene.

Mr. HINDMARCH said, he would then proceed to call his lordship's attention to an important matter, in which his learned friend said that Mr. Hills had used a portion of Mr. Laming's materials, and that was an infringement of his patent. Without going through all the cases which would bear on this point, he would advert to one of them, which was that of *Lister v. Leather*, and, when they went through it, his lordship would find that it had not the slightest bearing on this case. That case was in reference to a machine with a great variety of parts, but it was only the combination that was claimed. The learned judge said that, if they took a portion of the elements forming that combination, and that part was material to the combination, that portion taken by the defendant must be an infringement of the patent, the rest of the machine performing the same thing as that of the plaintiff; it was, therefore, an imitation, and was substantially the same as that of the plaintiff. His learned friend had said, that Mr. Laming's patent consisted of combined elements, that Mr. Hills had taken every one of them, and had infringed his patent. But that was not identical with the case of *Lister v. Leather*. Not one of the cases referred to by Mr. Bovill or Mr. Denman supported such a proposition. The learned counsel having referred to the case of *Seymour v. Hill*—a question as to the using spent madder entitling the inventor to a patent—

The LORD CHANCELLOR said, it was not shown that the second patent was held to be bad. All that was decided was, not a question of law, but of fact; and, instead of being withdrawn from the jury, ought to have been left to the jury.

Mr. HINDMARCH had no doubt of it; but it was quite clear the court thought there were circumstances in the case which might have made the process the subject of a patent. It showed that, although a small difference existed between spent madder and fresh madder, it might be the subject of a patent for a process to which the other was to be applied. That brought him to the end of what he had to say in reference to Laming's patent; and he then came to the question of hydrated or precipitated oxide of iron. His learned friend on the other side contended that it must be taken to mean, not only hydrated, but precipitated oxides. The patentee said he claimed hydrated or precipitated oxides; and, if Mr. Hills in his specification described the process of making hydrated or precipitated oxides, it must be inferred that it was meant that he gave oxides both hydrated and precipitated; and, although he sometimes used the word "or," it was as often used conjunctive as disjunctive. It was clear, that it was not intended to be disjunctive, as both adjectives applied to the same thing. The plaintiff meant to say, "Use oxide of iron, but it must be hydrated, and so it must be precipitated; and, bear in mind that, whatever oxide you use, it must be precipitated." He had not gone into the cases so well known as to the construction of the word "or," and he saw nothing in the document contrary to, but a great deal to show that it was the intention of the patentee, that the oxide to be used must be hydrated and must be precipitated. He asked his lordship to bear in mind that, up to the date of the plaintiff's patent, nobody was aware of the effect of hydrated oxide. There was nothing to show that anybody was aware of it; and none of the documents gave evidence that hydrated oxide had an advantage. At the time the plaintiff was applying for his patent, Laming and Evans were engaged in making experiments for applying for a patent for the same invention which his learned friend said had been published, and must have been known to the world. Then, how came it that they were attempting to get a patent for that invention? and, in describing the patent that Laming and Evans were applying for, they used the same terms as were used in the patent of Mr. Hills; but, as to hydrated oxide, all the circumstances showed that the invention was a novelty at the date of the patent. It was true, there were various documents; but his learned friend had relied on one issue, that the invention was not new, but that had been submitted to the jury. He had endeavoured to condense his observations into as small a space as possible, and he relied on his lordship's decision having regard to the evidence, as was done in the Court of Exchequer; and, if there was any point of law that he had not mooted, he was sure his lordship would give effect to it, let it be on one side or the other. In conclusion, he should contend that his learned friend had not made out his case; and, on the face of the documents, that he had failed to show that the invention of the plaintiff was not new.

Mr. BOVILL then rose to reply, and said, he regretted that Mr. Hindmarch had introduced into the case matters to prejudice his lordship's mind. He regretted that he could not go into facts; but he would just refer his lordship to a few lines in the evidence of Mr. Newton, to prove that Mr. Laming was the real inventor of this improvement:—

Mr. DENMAN: Are you a patent-agent?

Witness: Yes.

Mr. DENMAN: Did you, in September, 1848, attend before the Attorney-General with Mr. Laming?

Witness: I did.

Mr. DENMAN: Do you recollect, upon that occasion, a paper being read to the Attorney-General, of which this is an extract:—"Recovery of some of the purifying reagents for repeated use. For this purpose, I simply expose to the air the sulphuret of iron which results from the purification of illuminating gas by hydrated peroxide of iron. This exposure causes it to change back again, partly into a peroxide of iron and partly into a sulphate of iron?"

Witness: I read that before the Attorney-General.

Mr. DENMAN: I believe here is your own signature to this paper, in red ink:—"These particular six sheets were read by me before the Attorney-General, in opposition to Mr. Hills' claim, Sept. 15, 1848?"

Witness: Yes.

From that, it would be found that, more than a year before Mr. Hills took out his patent, Mr. Laming put in that paper. There was strong reason to suppose that Mr. Laming invented it in the first instance, and that Mr. Hills saw Mr. Laming's experiments that were going on; but that was a matter that he (Mr. Bovill) was then not at liberty to go into. There had been several matters introduced by Mr. Hindmarch; but it was clear that, in February, 1849, Mr. Laming obtained a patent for his invention in France, and, at that time, Paris was illuminated by gas under Mr. Laming's patent; and, to say that it would not do, was perfectly absurd. He (Mr. Bovill) now came to the consideration of this patent. Mr. Hindmarch had said that he (Mr. Bovill) consented, in the Court of Exchequer, that the court should only look to the specification; but not only did he not do so, but he strongly protested against it. The first proposition to be considered was the different specifications; and his lordship would desire to be informed as to the state of knowledge existing at the time the patents were taken out.

The LORD CHANCELLOR said he felt the greatest difficulty, but he asked the learned gentleman to give him every information existing at the time as to what were the things designated in the specification, as now chemical matters varied very materially. Croll's specification of 1840 described certain things, and it would be for him to prove that the combination of 1840 was perfectly different from the description of the same thing at the present time. The learned gentleman might prove what external objects would answer that description, but further than that he could not go.

Mr. BOVILL said, as far as what was generally described he would, but he must take exception to those cases that did not prove the state of knowledge at the time to appreciate the meaning of the words. He felt a difficulty—as, in the case of a will, when they desired to know the true construction of the will, or what, in common parlance, the testator intended. But that was not so in this case. The question was, What do the words express? What was the intention of the words employed, and how would competent persons understand the words that were used? He (Mr. Bovill) should submit that, to ascertain what was the meaning of the words, they must consider whether the language was such as would be understood by a person competent to deal with the subject.

The LORD CHANCELLOR: If they are not technical words, but words of ordinary language.

Mr. BOVILL said, there might be many cases in which the state of knowledge at the time would be material. When they were dealing with a patent they were dealing with something which was tangible; but, when they were dealing with chemicals, they ought to have evidence of the state of knowledge at the time.

The LORD CHANCELLOR said, that was a matter of fact. He took it that all undisputed evidence necessary to enable him to understand written documents, and comprehend the meaning of terms, was evidence that the learned gentleman might use.

Mr. BOVILL said, he proposed to go further, for no specification, whether for mechanical or any other science, mentioned every detail; but they were assumed to be known by competent persons. They must take what was implied, as well as what was expressed in the specification.

The LORD CHANCELLOR remarked that it might be necessary to mark the limits of the boundary by which it might be done.

Mr. BOVILL said, it would be very difficult to lay down any rule that would apply to all cases; but he should submit that the judgment in the Court of Exchequer was clearly wrong, being limited to cases decided on mere comparison of specifications. He would call his lordship's attention as he went on to any authority bearing on the question, as far as circumstances might be admitted.

The LORD CHANCELLOR said the best case as to surrounding circumstances was that of Lady Hewley, which was where a particular expression at the time had a distinct meaning, but there was nothing in the document to refer to those circumstances. That might be an explanation of "surrounding circumstances." They must take the atmosphere in which men lived and moved at the time.

Mr. BOVILL said, his learned friend had made some observations on the case in the House of Lords, in reference to the case of *Seed v. Higgins*. There was nothing particular in the evidence, for one side said there was an infringement, and the other said there was not; but, the court said that the construction of the specification was with them, and was not for the jury. In the case of *Unwin*, the House of Lords rejected all the evidence because it was a question as to the meaning of the specification; and, although evidence on the point was given to the jury, that ought not to have been done, as it was purely a question as to the meaning of the specification; where a person described the particular character and nature of his invention, and in language so as to be understood by a common workman, it was difficult to see how there could be two applications of the same rule. When his friend referred to the case of *Beard v. Egerton*, he proved the proposition for which he (Mr. Bovill) was now contending. It was a case in reference to a photographic process; and, if it had been carried out as described in the specification, it would have been utterly destroyed. What the court said in that case was, "We will not take the language as it stands, because no person with a reasonable degree of skill would do so." The court held the specification to be good. The judge asked a witness if the specification were to be understood in the language of it, whether it would not destroy the process, and he said it would; upon which Mr. Justice Maule directed the Jury to nonsuit the plaintiff. In that sense, he gave a plain and intelligible rule, which could be applicable to all specifications; and Croll's and Laming's specifications, ought to be read in that sense, and in the sense which his learned friend himself said applied to Hills' specification. His argument was, that one patent for a substance to be applied to a particular purpose, could not be the subject of another patent, not for a similar purpose, but for the same purpose. He came then to the case of *Minter v. Moore*, which was for an infringement of a patent chair, where the leverage was to be adjusted to the weight of the body, and to place it in a reclining position. Another person of the name of Brown, arranged a chair which, by pulling a stop, produced the same effect as Minter's chair, and gave the elevation required. Now, that was a compound chair, correctly corresponding with the compound of hydrated oxide and chloride of calcium. That was held to be a bad patent, and he said that Brown's chair was identical with Hills', and was on all fours with it. Mr. Laming claimed for the combination, and a part of it was taken by Hills. That was the case of *Minter v. Moore*. In the case of *Bush v. Fox*, in the House of Lords, the patent was, by means of compressed air in chambers to enable miners to work in mines, and divers, under water. Lord Cochrane had patented an invention for the purpose of supplying miners with air, while excavating, and the other patent was to supply divers with air, while under water, and the court held that both inventions were substantially the same—that they were for analogous purposes, and that the second patent could not be maintained. He had showed, in the case of *Newton v. Vacher*, that the same material, if for a different object, might be the subject of a patent. In that case, one object was for the purpose of making an air-tight water-joint with soft metal. Another person applied soft and hard metal, his object being to prevent the friction of wheels, and in that case, it was held that the patent was good, as it was a new application. Mr. Bovill then referred to the cases *Crane v. Prince*, and *Booth v. Kennard*, and, after some observations, said that they did not apply to the present question.

The LORD CHANCELLOR said, the half of the judicial time was taken up in discussing cases gone by, nineteen-twentieths of them being utterly inapplicable.

Mr. BOVILL said that was so, and, amongst the few cases he cited in his opening, was that of *Booth v. Kennard*, which was a patent for the purpose of making gas from seeds, instead of oils distilled from seeds.

The LORD CHANCELLOR said, that was a short process to get gas from seeds.

Mr. BOVILL, having cited the case of *Muntz v. Foster* and several others, said he believed that he had noticed the whole of them that had any real bearing on the question, and he would then proceed to see what Mr. Hills really claimed. In his claim a great deal was said, at one time, with regard to hydrated oxides. He took out a patent for nine different subjects, but he disclaimed six out of the nine. He obtained leave to disclaim them as early as 1853, but he never enrolled the disclaimer until 1856, to embarrass the public, and to levy black mail from them; as, for three years, he kept his disclaimer in his pocket, and the public knew nothing about it. What Mr. Hills claimed was this. He said first, that he claimed the use of oxides of iron, but he did not stop at hydrated or anhydrous, but he said "or precipitated." He claimed oxides of iron alone, he claimed them mixed with various other substances. He was using the same materials as chloride of calcium in Laming's patent, but in a passage in his specification he said he did not claim them. The learned counsel then went on to point out that what Mr. Hills claimed was precisely and identically the same as pointed out by Mr. Laming in his specification, and it was a fallacy for his learned friend to put forward the claims of Mr. Hills, separately and independently for hydrated and precipitated oxides, alone or in combination, without reference to Mr. Laming's patent. Mr. Hills said he claimed them alone and in combination with other materials and other substances that would act in the same way. He claimed oxides alone; or mixed with other materials, and, he claimed also, the vehicle by which they were to be used, such as porous matter or sawdust. His claim was for every oxide of iron, with or without other materials, or mixed or unmixed with other materials; he also claimed the renovation of these materials, so that they might be used over and over again for the purification of gas. The first question on the specification that would arise was, what oxide of iron did he claim? and on that point they had the very high authority of Dr. Taylor, who was asked whether there was any difference between hydrated and precipitated oxide of iron, and whether he considered that both were claimed by Mr. Croll? and his answer to that was:—

> The term hydrated oxide of iron may be applied to oxide of iron, either found in nature or formed artificially; but the term precipitated oxide of iron would be applied to that which was formed artificially only.

But he also said that all precipitated oxides were hydrated; then, in that case, he would use the word hydrated. If it became a question between them as to using natural hydrated and not precipitated oxide of iron as to the infringement of the patent, Doctor Taylor said the term hydrated oxide might be applied to oxide of iron found in nature, and formed artificially; but that precipitated oxide of iron would be applied to that formed artificially only. He then said, you may prepare such things artificially, and that hydrated and precipitated oxide of iron may be conveniently prepared in this way. There was another unimportant matter to be considered. In page 7, line 12, he claimed the precipitated or hydrated oxides of iron; and his learned friend said, in the first place, that Mr. Laming had no right to use the word hydrated as included in precipitated; but what would he do when he came to the words where he claimed all oxides of iron from whatever source obtained, either by themselves or, what was much better, made from more porous materials? He would refer to the specification, as he did not intend to limit the application to the oxide of iron, including the precipitated, but something more. In page 5, he described the identical mode of preparing them, but he did not limit himself to that mode of preparing them, or that source, but he said, "I claim them all from whatever source obtained." If Mr. Hills was at liberty to claim that under his patent, nothing more could explain those matters than was contained in the original specification. He must stand or fall by the specification as it stands, and be governed by the words of it as they actually stand. If they were right or wrong in claiming hydrated or precipitated oxides, and it was said that they could claim native precipitates, then he (Mr. Bovill) would contend that they would not purify. He would not trouble his lordship further with that part of the patent as to what he claimed, but would proceed to see if some of those things had not been given to the public before Mr. Hills' patent was taken out. Mr. Hindmarch had referred to *Haydon's Dictionary of Chemistry*, printed in 1809, to show that it did not contain the word "hydrated."

The LORD CHANCELLOR said, he would not look at that book, but at the evidence.

Mr. BOVILL said, then he would ask his lordship to receive evidence as to Heard's patent, as there was no evidence of that before the jury at the trial. His learned friend, Mr. Hindmarch, had said, that the word "hydrated" was not in the book, but he had got it, and it was there.

The LORD CHANCELLOR said, he would not take the statement, or the answer.

Mr. BOVILL said, he was satisfied with his lordship's observations. The learned counsel then went on to refer to Heard's patent, and contended that, in addition to the use of lime in a dry state, he said he would use metallic oxides, which had a sufficient affinity for sulphur; that he mixed them in a less or greater degree in separate vessels for the purpose of getting rid of an offensive smell. He proposed a mode of getting rid of sulphuretted hydrogen in gas, and how it was to be done—which was, by taking such metals, or such oxides of metals, as possessed a sufficiently strong affinity to sulphur to answer the purpose required. He particularized the oxides, and he mentioned the oxide of iron; and at that time the difference between hydrated and anhydrous oxides was not known. He told the world that sulphur and sulphuretted hydrogen in gas were generated, and the class of oxides that would relieve them from it, and amongst them was oxide of iron. According to the state of knowledge up to 1840, it could be known that hydrated oxide would do it, and that anhydrous oxide would not do it. He would trouble his lordship no further upon Heard's patent. He now came to Croll's patent, and in that he expressly claimed the mode for removing sulphuretted hydrogen from coal-gas. He put it as a distinct claim, and not in an incidental manner. His claim was for removing sulphuretted hydrogen from coal-gas. He named the oxides, and amongst them was the oxide of iron. He did not claim it as a new discovery, but, after freeing the gas from ammonia had taken place, he claimed the application of it, in a particular manner, in the manufacture of coal-gas, and not otherwise. He pointed out the oxide to be used for the purpose, and no other. There was

another particular circumstance connected with this matter, for throughout the patent, whenever he spoke of zinc, he spoke of oxides of iron in the plural in every part of his specification. What were oxides of iron—hydrated and anhydrous? Did the expression "oxides of iron" include both hydrated and anhydrous? He had before him the judgment of the Court of Exchequer, in which it was taken that Croll meant both sorts of oxides, hydrated and anhydrous; and, if it were to rest there, it would be conclusive that Croll had anticipated Hills' patent; and how they were to get out of that on a comparison of the two specifications was a matter of difficulty. If Croll's patent was for hydrated and anhydrous oxides, it was clear that Hills' patent could not be supported; and, if it should turn out that both would answer, and both would purify gas, Croll did not know the difference between hydrated and anhydrous oxide, and, therefore, he meant both. It was precisely the same as if he had put in his specification—"You may use either hydrated or anhydrous oxide; but, as both will purify, it is not necessary to make any distinction between them." Mr. Hills had made the discovery that hydrated would do it, and he was not aware that anhydrous would not purify; but, the moment it was proved that anhydrous would not do, he could not support his patent. Having adverted to the use of black oxide of manganese—a valuable system of renovation—he said he would now come to Laming's patent, and, on the first point, it could not be said, that Laming had been anticipated by Hills. Mr. Laming claimed the use of chloride of calcium for purifying from sulphuretted hydrogen; he claimed, in combination, the muriates of iron and other mixtures for purifying gas, so that it might be purified from all ammonia, and sulphuretted hydrogen. He claimed the oxides of iron for the same purpose for which Mr. Hills claimed them, which was for the purification of gas; Mr. Laming claimed some oxides, but Mr. Hills claimed them all; and that being so, he had claimed a portion of those substances used by Mr. Laming in his process of purification. He said, in his specification, that such oxides were useful for purification, and need not be removed. He did not claim the mixtures, but the application of them when made. Mr. Hills said he claimed the combination of oxides of iron, but he was not at liberty to claim analogous substances, by which they could get the identical thing, got for the same purpose, and arranged in the same way. Having pointed out the difference between carbonates and oxides, the learned counsel next adverted to the claim of Mr. Hills to the renovation of materials, and made that a part of his patent, although the principle had been enunciated, and there was a general knowledge that oxide of iron when exposed to the air might be revivified, and therefore it was not a subject for a patent, looking at the state of knowledge at the time. Croll said he adopted it, and brought it to a red heat, and Hills, in his specification, said he proposed to apply it to heat. Mr. Croll said, at page 5, in his specification:—

> This material, after it has ceased to absorb the sulphuretted hydrogen, is to be removed from the purifying vessel, and roasted in an oven to expel the sulphur which it then contains. After this material has become thoroughly red in the oven, I have found from two to three hours further time to be sufficient to accomplish this object, taking care that whilst it is being roasted, it be well stirred about in the oven. After this operation is completed, the material is fit again to be employed.

Therefore, it was clear that this process of renovation was part of Mr. Croll's patent. He believed that he had gone through all the topics, and that he had answered all the points; and he would submit, in conclusion, upon the facts shown in the specification, and with the light thrown upon it by the evidence of Croll and Laming, there was that in it, which should prevent a person in the position of Mr. Hills from using, as his own, the application of oxide of iron, in a hydrated state, for the purification of gas, either in a hydrated state or in the ordinary state by Croll, and in combination by Laming, Croll, and Heard. He, therefore, submitted that Mr. Hills' patent was bad in law, and could not be maintained.

The LORD CHANCELLOR: It is necessary to understand exactly in what manner this argument now comes before me. I am hearing a cause in equity, in which the plaintiff, Mr. Hills, applies for an injunction to restrain Mr. Evans from an infringement of Hills' patent. It is the habit and the rule of a court of equity not to grant that injunction, at all events at the hearing, nor to make it perpetual, unless the legal validity of the patent has been conclusively established. This bill contained a great variety of allegations, for the purpose of showing that the legal validity of the patent in question—that is, Mr. Hills' patent had been finally established. The allegations may be described generally as showing a long proceeding at law, to which Mr. Evans, the defendant, is represented as being virtually a party. The bill then contains an allegation that, in the stage in which this matter was left by the Court of Exchequer, notice of a proceeding by way of appeal having been given by the defendant at law, an agreement was made between the parties, by which the legal validity of Mr. Hills' patent was finally admitted and allowed. The bill alleges that Mr. Evans, the defendant, was a party to that agreement, and ought to be bound by it. I was of opinion that I could not bind Mr. Evans by that agreement, and that Mr. Evans had a right, therefore, to say that he was entitled to the benefit of that appeal. As to the other defendants who were parties to the agreement with Mr. Hills, the plaintiff might have prosecuted, but for that agreement. The ordinary course would have been, therefore, either to leave the parties to prosecute to its final issue that action which had been so commenced, and in which the jury had given a verdict which the Court of Exchequer refused to disturb, or else to put upon the plaintiff the obligation of bringing a fresh action. I was exceedingly unwilling—as I trust I shall always be—to send the parties from this court to the other side of Westminster Hall. I have authority to try that question, and I therefore proposed to try it, which the parties acceded to. The question, therefore, of the validity of the patent has been discussed before me, as it might have been in the Court of Exchequer chamber. The argument, although the points do not in reality, when rightly considered, extend over any very great space, nevertheless has extended over a very considerable period of time, partly because the limited extent of the question proper for argument, and admissible to be considered, had not been previously defined in any proceeding, and I could therefore only trust to counsel and rely upon them not to wander and to expatiate into a field wider than was required. I cannot say that I have any reason to complain of the argument, although it was impossible, and it would be unreasonable to expect, that counsel should, in all cases, resist that temptation. Now, I have considered it very much during the four days it has been in discussion, and the conclusion that I have arrived at is, that the patent is good and valid in law. The reasons for that conclusion I shall give at some length; but, inasmuch as there remains another question to be tried in the cause—namely, the question of infringement—I propose to postpone my judgment upon that point until I have heard the whole of the cause. It was necessary, however, to take this discussion first, out of consideration for the parties; because the infringement, if it is discussed before me, may render it necessary to have oral evidence at the bar; and therefore, if it had happened that I should have arrived at the conclusion of the invalidity of the patent, that further question would have become immaterial, and I was desirous of having the primary matter first discussed and considered, before I put the parties to the expense of preparing themselves for the second question. I must, however, now intimate that my opinion is, for the reasons I shall hereafter give, in favour of the legal validity of Mr. Hills' patent; and, having intimated that result, the question now for counsel, on either side, to answer is this—when they will be prepared to go on with the further hearing of this cause, or whether it is seriously intended, on the part of the defendant, to raise and discuss the question of whether his process be or be not an infringement of Mr. Hills' patent? When will you be prepared?

Mr. BOVILL: Will your lordship allow me to communicate with my junior counsel?

Mr. DRUCE: Would it be possible for your lordship to give us a day or two days to answer that question? At present, we cannot communicate with those who lead us. It is quite possible, if we had a little time to consider it, our views might be modified.

The LORD CHANCELLOR: I think it very reasonable that they should have two or three days to consider that, Mr. Grove.

Mr. GROVE: Certainly; I should have no objection to anything your lordship desires.

The LORD CHANCELLOR: Of necessity, if that question is to be contested, you will require, on both sides, to have the witnesses examined at the bar?

Mr. GROVE: Yes, my lord.

The LORD CHANCELLOR: Then, of course, you would require some time to prepare for the trial?

Mr. GROVE: We should not require any considerable time. I do not at all wish to press it.

The LORD CHANCELLOR: The only thing I am at all anxious about, Mr. Bovill, is this:—I should like very much, for your sakes particularly, to have this matter, if it is to be discussed, heard before your circuits commence—that is to say, I suppose you do not desire to carry about with you the quantity of chemical knowledge which this case requires, unless, indeed, you have argued it so often that it has become a lesson you will never forget?

Mr. BOVILL: I should be glad to get rid of a little of the sulphuretted hydrogen in the country.

The LORD CHANCELLOR: With Mr. Grove, it is the normal condition; but, I think, not so with you.

Mr. BOVILL: With regard to the other parts of the case, at present I have not any information about them.

The LORD CHANCELLOR: It stands in this way:—The plaintiff has no reason to complain, because he has got an injunction. If I heard the cause, and decided for him, I could not give him more than he has got already; therefore, it will be no harm to him to give you a little time. But, whenever a cause has once begun (and, of course, as I suspend giving the reasons of my judgment), I think it is desirable that we should pursue it to its conclusion as soon as convenient.

Mr. BOVILL: I will communicate with Sir Hugh Cairns, if your lordship will permit me, and perhaps your lordship will allow us to mention it to you again; at all events, it could not be for a few days.

The LORD CHANCELLOR: It could not be. It is a difficult matter for me to fix a time before your circuits commence; but you can mention it on Friday, and then, perhaps, an arrangement can be made.

FRIDAY, JAN. 24.

Sir HUGH CAIRNS: In this case, your lordship was good enough to give us till this morning to consider the course that we should propose to your lordship to take as regards the question of infringement. My lord, the conclusion at which we have arrived is this:—Your lordship is aware that the patent in question expires next year; we, also, have been for several months under an injunction, which prevented us using what is said to be an infringement. Necessity is a fruitful parent, as your lordship knows, and the experience of those months has led us to consider the means that we had of resorting to other processes. The consequence is, my lord, that whatever confident opinion we might feel as to the question of infringement or non-infringement, we do not think it of sufficient importance to raise that question, or to have that question adjudicated. Your lordship was good enough to say that you would dispose of the case upon the question of the validity of the patent at a future day. I do not think it would be proper for me to open any argument now, inasmuch as the question of the costs of the suit will then have to be considered; but there are two or three matters which I would humbly mention, not by way of argument, but by way of statement, for the purpose of asking your lordship to give them what consideration they are entitled to.

Mr. ROLT: If there is any question remaining, of course the plaintiff will have an opportunity of speaking to it.

Sir HUGH CAIRNS: If your lordship thinks it convenient.

The LORD CHANCELLOR: Sir Hugh Cairns puts it thus:—He has been told that I mean to give judgment for the validity of the patent. He, for the present, gives up, as immaterial to be argued, the question of infringement; then, making that concession, he wishes to direct my attention to matters that he thinks important upon the question of costs.

Sir HUGH CAIRNS: I make it simply as a statement, because my learned friend will see that, upon the matters I am going to state, all the arguments in the world would not lead your lordship's mind to one conclusion or the other. Upon their being mentioned, your lordship will be able to dispose of them. In the first place, your lordship remembers that one part of the case raised at the present hearing was, that, by the proceedings which resulted in a compromise with the London Gas Company, the present defendant, Mr. Evans, was concluded and estopped; and, upon that point, your lordship held for the defendant, and not for the plaintiff. What weight that should have in disposing of the costs of the suit, I leave to your lordship. The other matter I mention is this:—Your lordship is aware, from the history of the cause, that proceedings were taken before the Lords Justices, which, of course, occasioned expense, and which resulted in nothing coming of those proceedings. I ask your lordship to consider that, in disposing of the question of costs. The third point is this: your lordship is aware that the Patent Amendment Act, as it is called, provides that, where there has been a trial of the patent at law before a jury, and the judge certifies upon the record that the validity of the patent has come in question, that in any subsequent suit or proceeding against an infringer or alleged infringer of the patent, in which the patentee shall be successful, he shall recover his costs as between solicitor and client, unless the judge shall otherwise order.

The LORD CHANCELLOR: Is that the Act of 1852?

Sir HUGH CAIRNS: Yes, my lord. The bill in this case very fairly and properly prays the aid of that provision, and asks, in the prayer of the bill, that the plaintiff may have the costs of the suit as between solicitor and client. The observation that I have to make upon that, is this: I humbly represent to your lordship, that the result of the present proceed-

ings is this:—It has been held by the court, now, to be a continuation, virtually, of the proceedings against the London Gas Company, for the purpose of supplementing and completing those proceedings; and the way in which this case has now been dealt with by the court has been, not to treat it as an independent proceeding *ab initio*, to be judged of as such. Those three points will receive from your lordship the consideration which they are entitled to; and I do not add a word by way of argument upon them.

Mr. ROLT: Perhaps, my lord, I may now say all that is necessary to be said upon these points. With respect to the contention that Mr. Evans was estopped by the compromise, the real contention was this: the defendant, Evans, said, "I am in no way affected by that trial; I desire to have the whole trial over again;" and, from the first, that was the thing which we had to controvert. We said that he was estopped altogether; but, certainly, our great contention was that in which we succeeded, that he was estopped by the trial, though not further than your lordship has held. The point that was argued before the Lords Justices, and would have been argued before your lordship, is this—that they said, "We have nothing to do with the trial; it must be tried again, as if there had been no trial at law." Therefore, the whole of that expense was occasioned by their contention. As to the failure of the proceedings before the Lords Justices, your lordship has all the facts relating to those proceedings before you, and it was no fault of the plaintiff at all.

The LORD CHANCELLOR: It was a common misfortune.

Mr. ROLT: I think the costs should follow the result of the litigation. I see no ground, your lordship establishing the validity of the patent, why the provisions of the Amendment Act should not be complied with, as to the patentee getting his costs between solicitor and client.

The LORD CHANCELLOR: I will give judgment on Wednesday next.

WEDNESDAY, JAN. 29.

The LORD CHANCELLOR: In this case, I am now to give my reasons for the order which I have already intimated my intention to make in this case. It must be recollected that it comes before me upon a motion for decree, and I am, therefore, hearing an original cause. The first thing that it was necessary to determine was the question: whether the legal validity of the plaintiff's patent had been finally established at law? Now, the plaintiff had commenced two actions at law some time previously to the institution of this suit, one against the London Gaslight Company, and the other against the defendant. It was ordered that the action against the defendant should stand over to abide the result of the action against the London Gaslight Company. That last action was tried at Guildford, and certain points were reserved for the consideration of the Court Banco. Rules were subsequently obtained by the defendant (verdict having been found for the plaintiff) for entering a verdict for the defendant, or for nonsuiting the plaintiff, or for a new trial. All those rules were discharged by the Court of Exchequer, and there was then a proceeding under the Common Law Procedure Act, for the purpose of carrying an alleged matter of law involved in the decision of the Court of Exchequer by way of a proceeding in error to the Exchequer Chamber. The further progress of the cause for that purpose was interrupted by an agreement; and one of the objects of this bill is to have it declared that the defendant is bound by that agreement. I came to the conclusion upon the first discussion that I could not enforce the agreement, and it became necessary, therefore, and was agreed on all sides, that the question should be taken up at the point at which it was left—namely, the point which it had attained in the Court of Exchequer in the action at law against the London Gaslight Company, when the argument was entered into. It must, therefore, be recollected that the particular subject of discussion before me has been that alleged matter of law reserved upon the trial in *Hills v. the London Gaslight Company*, and which, it is stated, might have been the subject of a proceeding in error in the Exchequer Chamber. Now, that alleged matter of law consisted of an argument against the novelty of the plaintiff's invention from the fact that it had been previously known and published; and, in proof of that, two specifications filed under previous patents, granted to a person of the name of Croll, and to a person of the name of Laming, were produced upon which to found the argument that the invention had been already made known to the public. When it was agreed that I should take the matter up, which it was alleged might have been carried to the Court of Exchequer Chamber, an application was made on behalf of the defendant, that I should permit another specification to be added to those upon which reliance had been placed in the Court of Exchequer—namely, the specification of a patent granted to one Heard in the year 1806, and it was agreed between all parties that the argument should proceed upon the basis of that specification being considered and treated before me as if it had been given in evidence before the jury upon the trial of the action. Now, the argument has been that it is the duty of the court and the right of the court to construe those earlier specifications, and that if I found from the specifications so construed, when collated and compared with the specification of the plaintiff's patent, that the invention described in the one was identical with the invention described in the other, the court might at once arrive at the conclusion that there was no novelty in the invention, and deal with the whole matter as matter of law, and not as matter to be submitted to the jury, and that, undoubtedly, is a question deserving very serious consideration. It is, no doubt, true, as a proposition of law, that the construction of a specification, as the construction of all other written instruments, belongs to the court; but the specification of an invention contains most generally, if not always, some technical terms, some phrases of art, some processes, and requires generally the aid of the lights derived from what are called "surrounding circumstances." It is, therefore, an admitted rule of law, that the explanation of the words, or technical terms of art, phrases used in commerce, the proof and the results of the processes which are described; and, in a chemical patent, the ascertainment of the chemical equivalents—all these are matters of fact upon which evidence may be given, and contradictory testimony may be adduced, and upon which undoubtedly it is the province and the right of a jury to decide. But, when those portions of a specification are abstracted and made the subject of evidence, and therefore brought within the province of the jury, the direction to be given to the jury with regard to the construction of the rest of the patent, which is conceived in ordinary language, must be a direction given only conditionally, that is, upon the hypothesis or the basis of the jury arriving at certain conclusions with regard to the meaning of those terms, the signification of those phrases, the truth of those processes, and the results of technical procedure described in the specification. And so the rule is given by Mr. Baron Parke, in delivering the judgment of the Exchequer in the case, I think, of *Mitson v. Harford*. The language of the learned judge, which I adopt, is in these words:—"The construction of all written instruments belongs to the court alone, whose duty it is to construe all written instruments as soon as the true meaning of the words in which they are couched, and the surrounding circumstances, if any, have been ascertained by the jury; and, it is the duty of the jury to take the construction from the court, either absolutely, if there be words to be construed, as words of art, or as phrases used in commerce." The duty of the court would be confined to this—to give the legal construction of such a document taken independently; but, after that duty is discharged, there would remain a most important function to be still performed, which is, the comparison of the two instruments when they have received their legal exposition and interpretation; and, as it is always a matter of evidence what external thing is denoted by any description, when the jury have been informed of the meaning of the description contained in each specification, the work of comparing the two, and ascertaining whether the words interpreted by the court contained in specification A do or not denote the same external matter as the words interpreted and explained by the court contained in specification B as a matter of fact, it is, I conceive, a matter within the province of the jury, and not within the function of the court. Granting, therefore, to the full extent, the interpretation of the expression of the rule which is here contained, and taking either specification as so interpreted, whether the two specifications that are brought into comparison do or do not indicate the same external matter, must be determined by the jury, and not determined as matter of law by the court. And I find that this has been the case and the course adopted by all the judges in a great variety of reported cases at *Nisi Prius*. It was the course adopted in a case which was exceedingly similar to the present one—*Muntz v. Foster*. An antecedent specification of Collins was explained to the jury by Lord Chief Justice Tindal, and the specification of Muntz was equally explained, but it was left to the jury to determine, after that explanation had been given, whether the two things which the court had interpreted did or did not denote the same subject? The same course was also adopted by Lord Chief Justice Tindal in another case that came before him of *Walton v. Potter;* and I find no doubt intimated that that was the correct course to be adopted by the court, and that the function of the court and the function of the jury were in that manner clearly distinguished. Now, some doubt was thrown upon this subject by what fell from a noble and learned lord in moving the judgment of the House of Lords in the case of *Bush v. Fox;* and it seemed to have been supposed by Lord Chief Baron Pollock in the case of *Booth v. Kennard*, and evidently was supposed by the Court of Exchequer in the case of *Hills v. the London Gaslight Company*, that *Bush v. Fox* had laid down this rule—that it was the province of the court to compare the two specifications, and that the court alone from that comparison might arrive at a conclusion of the identity of the subject. Now, I cannot too often repeat that what is said by a noble and learned lord, in moving the judgment of the House of Lords, does not by any necessity enter into the judgment of the House. The observations of Lord Cottenham in the case of *Nixon v. the Taff Vale Railway Company* are very pointed, and very useful to correct an erroneous impression which sometimes prevails that everything said by a noble and learned lord in advising the House is to be taken as if it were part of the determination of the House itself. Now, nothing will show the difference between the two things more forcibly than what occurred in this case of *Bush v. Fox*. In *Bush v. Fox*, which was an action brought for an alleged infringement of a patent, there was a plea of "Not guilty;" and, under that plea, the specification of a prior patent which had been granted to Lord Cochrane ten years before the date of the plaintiff's patent upon which the action was brought, was put in, and evidence was given by several witnesses that the process described in the one, and the details of the manner of working the one patent, were in all respects identical with the details of the manner of working the other. Upon that evidence being given, the Lord Chief Baron told the jury that, if they believed it, there was no question of fact for them, because there resulted from that evidence this conclusion of law—that the patent upon which the plaintiff relied had been anticipated by the antecedent patent, and that there was no novelty in the invention. Now, that was carried by way of appeal to the House of Lords; and the noble and learned lord, who was then Lord Chancellor, in moving the judgment of the House, expressed his opinion to be, that the direction of the Lord Chief Baron was perfectly right; that opinion was adopted by the House, and *Bush v. Fox* is merely a decision of the House of Lords that the particular ruling of the Lord Chief Baron in the circumstances that I have mentioned was a correct ruling in point of law, and ought to be affirmed. But, in advising the House, the noble and learned lord went further, and used these words:—"I am not indeed clear that the Lord Chief Baron might not have gone much farther, and that, even if there had not been any evidence at all, he might not have directed the jury to find for the defendant, because I think it was for the court to compare the two specifications together, and comparing the two together, it appears to me perfectly clear that the material part of the plaintiff's invention was involved in the invention of Lord Cochrane." Now, it is perfectly clear that the passage I have read has all the characteristics of an *obiter dictum*. The judgment, so far as the noble and learned lord desired to move the judgment of the House, was in affirmance of what had been done in the court below. The ruling of the Lord Chief Baron did not proceed upon a comparison of the specifications, and the noble and learned lord has made an observation, with regard to which he expresses himself in a most guarded form, that he was not clear that something further might not have been done than was done. It would be an unreasonable thing, therefore, to take this passage as the ground of the determination of the House, and a still more unreasonable thing to invest a cautious and guarded expression of the nature that I have read with anything like the irreversible and unchangeable quality that belongs to the decisions of the House of Lords. I cannot, therefore, consider the passage which I have read, notwithstanding the great and unfeigned respect which is due to the high authority of the noble and learned lord, as standing at all in the way of the conclusion I arrive at, borne out and supported as it is by what I conceive to have been the uniform practice at *nisi prius*—that, although the construction of the specification clearly is matter of law, yet, if there be two specifications to be compared, in order to arrive at a conclusion of fact, the right of drawing the inference of fact from the comparison belongs to the jury and is a question of fact, and not a question of law. Now, if that be the correct conclusion in the matter before me, this result would follow—namely, that the court of error, if the action had not been stopped by the agreement, but had been carried out to its legitimate end, must have pronounced upon the special case, or whatever form, under the Common Law Procedure Act, might have been adopted, for bringing the alleged question of law before me, and must have decided that there was no matter of law, and that the verdict of the jury was conclusive. It was put, and very correctly put, by Mr. Grove, that the proposition of the defendant could not be maintained unless he was prepared to contend that, upon this matter, there was no evidence at all to go to the jury; that it was the duty of the court to take the matter out of the hands of the jury, and to arrive at a conclusion as a conclusion of law, and not a conclusion of fact. But, though I have come to this determination in the matter, I do not mean to rest my decision exclusively upon that ground, partly because I permitted the argument to proceed at great length, as if this were matter of law; partly, because it will be more satisfactory to the parties to have a determi-

nation upon what has been argued; but, principally, because the conditions of the argument require me to express an opinion upon the point, inasmuch as I permitted another specification to be added to the materials for argument beyond those matters that were presented to the jury—I mean the specification of Heard. I have, therefore, to consider, and give my opinion upon the question that has been argued—namely, whether there be or be not anything in the specification which has rendered the plaintiff's invention matter of public knowledge, and, therefore, matter of public property, anterior to the granting of the patent? Now, I was extremely desirous to ascertain, in the course of the argument, if any clear rule had been laid down upon the subject—what shall be the nature of the antecedent information which shall be sufficient to anticipate and to vitiate a subsequent patent, upon the ground of want of knowledge? I think it desirable to consider that first as matter of proof, and then to consider what light can be derived upon that question from the cases that have been decided? Now, with regard to the specification of a prior patent, it is not to be distinguished in principle from any other publication. The only peculiarity attending the specification of a prior patent is this: that the specification must be considered as a publication. There has been some doubt with regard to books and documents, under particular circumstances, whether they can be considered as amounting to a publication. With regard to a specification, there can be no doubt; because the specification is that which the patentee gives to the public, and makes matter *publici juris*, in return for the privileges to be conferred upon him. But, upon all principles, a specification is not to be distinguished from any prior publication contained in a book published in the ordinary manner. Now, the question is, what must be the nature of the antecedent statement? I apprehend the principle is correctly thus expressed. The antecedent statement must be such, that a person of ordinary knowledge of the subject would at once perceive, understand, and be able practically to apply the discovery, without the necessity of making further experiments, and gaining further information before the invention can be made useful. If something remains to be ascertained which is necessary for the useful application of the discovery, that affords sufficient room for a valid patent. By the words of the Statute of James, it is necessary, for the validity of a patent, that the invention should not have been known or used at the time. These words are held to mean, not publicly known nor publicly used. What amounts to public knowledge or public user, is still to be ascertained. One of the means of imparting knowledge to the public is the publication of a book, or the record of the specification of a patent. If, therefore, in disproving that allegation which is involved in every patent, that the invention was not previously known, appeal be made to an antecedently-published book or specification, the question is, what is the nature and extent of the information thus acquired, which is necessary to disprove the novelty? There is not, I think, any other general answer that can be given to this question than this—that the information as to the alleged invention given by the prior publication must, for the purposes of practical utility, be equal to that given by the subsequent patent. The invention must be shown to have been before made known. Whatever, therefore, is essential to the invention, must be read out of the prior publication. If specific details are necessary for the practical working and real utility of the alleged invention, they must be found substantially in the prior publication. Apparent generality, or a proposition not true to its full extent, will not prejudice a subsequent statement, which is limited, accurate, and a specific rule of practical application. The reason is manifest: because much further information, and therefore much further discovery, are required, before the real truth can be extracted and embodied in a form to serve the uses of mankind. It is the difference between the ore and the refined and pure metal which is extracted from it. Again, it is not, in my opinion, true in these cases to say that knowledge, and the means of obtaining knowledge, are the same. There is a great difference between them. To carry me to the place at which I wish to arrive is very different from merely putting me on the road that leads me to it. There may be a latent truth in the words of a former writer, not known even to the writer himself; and it would be unreasonable to say that there is no merit in discovering and unfolding it to the world. Upon principle, therefore, I conclude that the prior knowledge of the invention which avoids a patent must be knowledge equal to that required to be given by a patentee—viz., such knowledge as will enable the public to perceive every discovery, and to carry the invention into practical use. This appears to be consistent with the decided cases. In the much-discussed case of the *House Hill Company v. Neilson*, Lord Lyndhurst, in the course of the argument, made use of these expressions: "If a machine is published in a book, distinctly and clearly described, corresponding with the description in the specification of a patent, though it has never been actually worked, is not that an answer to the patent?" Now, the words here involve that which I have already expressed as the rule. It was the case of the comparison of the two machines; and, to avoid the patent, Lord Lyndhurst says the machine published in the book must be distinctly and clearly described, and must correspond with the description in the specification of the patent. So, in similar language, though shorter, in the case to which I was referred in the argument in the Privy Council, Lord Brougham in speaking of a prior publication, and the information given in it, and whether it will vitiate a subsequent patent, speaks of the description as that which must be clear and distinct; and the invention must be shown to be plainly expressed in the prior patent. And, in one of the earliest cases which occurred in this matter—Arkwright's case—the object was with regard to a particular part of the specification. The language of the court was, "It is admitted this is not a new discovery, for Emerson's book was published, which was printed a third time in the year 1773; and that is precisely the same as this." Having arrived, therefore, at this conclusion, both upon principle and upon authority, I have now to examine the several specifications which it is alleged contain the plaintiff's invention. Now, the first specification is that of Heard, which was a patent granted in the year 1806. It was a specification for the application of lime to the purification of gas; and the chief object of the patent and of the specification is to describe the mode in which lime can be applied for that purpose, and the effect of the agent of purification when so applied. But, at the latter part of the specification, the patentee has added these words: "It must, therefore, be clearly understood that lime, in substance or in a dry state, fixed alkalies, or earth possessing alkaline properties, or such metals or their oxides as possess a sufficiently strong affinity with sulphur and sulphuretted hydrogen as to obtain the end desired, such as iron, manganese, zinc, copper, lead, &c., when mixed with the coals, laid upon their surface," and so on, "are calculated, in a greater or less degree, to divest the gas of the cause of the offensive smell." The argument was presented to me in the following form:—"It must be taken as a thing known at the time;" it was said by the learned counsel for the plaintiff, "that the oxide of iron had an affinity for sulphur and for sulphuretted hydrogen; and, therefore, that these words must be read, 'all such oxides of iron as possess a sufficiently strong affinity with sulphuretted hydrogen, and will answer the end of purifying gas.'" That, however, is not the literal interpretation to be put upon the words. That interpretation would limit the proposition to such oxides of iron as had that affinity. But the proposition of the patentee is, in terms, collected from the words that he has used, that all oxides of iron possess that affinity; and he does not merely limit himself to oxides of iron, for he says, "iron, manganese, zinc, copper, lead, &c." With regard to the greater number of these substances, the proposition is clearly, from the evidence, untrue; and, therefore, there is here what I have denominated "apparent generality"—giving no specific knowledge, no practical rule of application, but furnishing suggestions which might give a direction to inquiry, from which inquiry a specific, definite amount of practical information might possibly be elicited. That, unquestionably, according to the rules which we have endeavoured to ascertain, is not such information as will vitiate a subsequent patent, for it is not such information as will be sufficient to support a patent. It adds nothing to the real stock of the practical knowledge of mankind, and ought not to derogate from the validity and the benefit of a subsequent invention. The next specification is that which was taken out by a Mr. Croll, in the year 1840, and which was a specification directed to an improved method of purifying coal-gas from ammonia; and, secondly, to a peculiar mode of reconverting or manufacturing the salts used in the purification of gas. The avowed purpose of the patent, therefore, is limited to the purification of gas from one only of those particular materials which interfere with its illuminating properties, there being two admixtures necessary to be got rid of—namely, the ammonia and the sulphuretted hydrogen. But, in the course of his description, Mr. Croll says that the third part of his invention consists in the application of the black oxide of manganese; and the mode described, after it has first answered the purpose, is to renew it, and to restore its purifying powers by roasting it in an oven, to expel the sulphur which it has contracted, or taken up, in the course of the purification; and, after describing the mode of treating the chief substance to which he directs the attention of the public, he proceeds, at a later part of his patent, to say that the same effect may be produced by the application of the oxide of zinc and the oxides of iron, heated precisely in the same way as above described. This, therefore, is a proposition that the oxides of iron—that is, all the oxides of iron—may be applied in a manner that will admit of the same effect being prodnced. Now, it is an admitted fact that that proposition is untrue. It is a clear result, therefore, that the proposition would mislead only the individuals who relied upon it. If he took some of the native oxides of iron, or if he took the anhydrous oxide of iron, it is an established fact that they would not answer the purpose. This amount, therefore, of general proposition, is not true in the extent in which it is expressed, and it requires further invention and discovery to modify and restrain it within true limits, so as to admit of its becoming a rule of practical and useful application. In the latter part of Croll's specification he states that he claims the purification of coal-gas from ammonia, and the purification of gas from the sulphuretted hydrogen by means of the oxide of manganese and oxides of iron and the oxide of zinc, as hereinafter described. It is quite clear, therefore, that he claims the oxides generally; and, if you are to infer anything from what he states with regard to the manner in which they are to be applied, you would infer this conclusion—that they are to be applied in an anhydrous and not in a hydrated state. Now, I apprehend, that that has added nothing to human knowledge which has superseded or rendered unnecessary the practical invention of the plaintiff; and I pass from that to the last specification, which is the specification of Laming. Now, the specification of Laming speaks of a particular agent in the purification of gas, namely, chloride of calcium, and he describes the mode of procuring that purifying agent; and, it would appear that the process adopted, after producing chloride of calcium, would leave a residuum in which would be found hydrated oxide of iron, the application of which is the patent invention of the plaintiff. With regard to this residuum, all that Mr. Laming says, is—"In such cases the oxides or carbonates which result are useful for the purification, and need not be removed." His proposition is, therefore, with regard to the oxides or hydrated oxides of iron, which are found to result from the process that he directed, after obtaining the purifying agent, the chloride of calcium, is only that it is not detrimental to the use and agency of the chloride of calcium, but will rather assist and promote its operatiom. But, that is a perfectly different thing from the discovery that the hydrated oxide of iron altogether superseded and rendered unnecessary the chloride of calcium. Mr. Laming speaks of it, not notifying it; but he speaks of the residue as not interfering with the benefit of his process; but that is, as I have already observed, a perfectly distinct thing from detecting in that residue a latent substance, having a peculiar property which renders the renewing processes totally unnecessary. Mr. Laming further describes the mode of obtaining the carbonate, which is a distinct thing, in an economical manner; and he describes the mode of proceeding, the result of which would be the production of what is called by chemists, the sulphuret of iron; and, it appears by evidence, that when the sulphuret of iron is exposed to the atmosphere, it takes up from the atmosphere a certain amount of moisture, and is converted into hydrated oxide of iron. Mr. Laming, however, indicates nothing of that. He confines himself to the use of the object which is to be attained by the process he describes—namely, the sulphuret of iron, and the state in which that passes by the operation of another chemical agent—namely, the atmosphere, is nowhere indicated or described. The last part of Mr. Laming's specification speaks of the oxide of iron as something which, when added to the chloride of calcium, will make it more efficient. That, again, is perfectly distinct from pointing out the operation and agency of the hydrated oxide of iron when applied by itself, or applied in other combinations. Without, therefore, entering into this matter, which is so minute that it could not be adequately dealt with without a long previous description of the chemical results and properties of the different agents employed, I have arrived at this conclusion, after carefully examining the learned arguments that were advanced to me: that there is nothing in either of these three specifications which in the smallest degree forestalls, anticipates, or rendered unnecessary the plaintiff's invention, or gave to the public that peculiar benefit which they have derived from the discovery of the plaintiff. If, therefore, it belonged to me, if it belonged to a court of law to determine upon a comparison of the specifications whether that which is described by the plaintiff's patent has been adequately described and explained by antecedent patents, I should answer that inquiry in the negative. I cannot find in any one of those patents a clear, distinct, and definite indication of the admittedly beneficial discovery that was afterwards made by the plaintiff. I do not confirm this conclusion by any arguments derived from the fact that, if there had been anything in these specifications that indicated the plaintiff's invention, which has been an invention of great benefit and general use, undoubtedly, we should have found some trace of the use of that invention, under those patents, anterior to the time when the plaintiff's patent was taken out. The last subject of argument before me turned upon this—whether the plaintiff's specification was itself open to a similar objection—namely, in using words in a sense too general for the actual truth—that is to say, in describing the agent which he employed under words that would cover substances not capable of being

usefully employed; and the particular words in the plaintiff's specification are, that he makes use of hydrated or precipitated oxides; and it is said that "precipitated" is there opposed to "hydrated;" that there are some hydrated oxides which would not answer the purpose; and that, therefore, the plaintiff's specification is bad, for too great generality and for inaccuracy. But, upon examination of that specification, my opinion is, taking the whole of it together, that the only hydrated oxides (granting that that word is to be opposed to "precipitated," and disjoined from it) described by the plaintiff are the artificial hydrated oxides; and it is not pretended that there is any artificial hydrated oxide which will not answer the purpose. An objection was raised in the Court of Exchequer, by treating the word "precipitated" as narrowing, and correcting the generality of the word "hydrated." I prefer, rather, to rest upon the explanation that I have given—namely, that, if the word "hydrated" be taken by itself, and be considered as including more than precipitated oxides, it must still be confined to those hydrated oxides which are artificial; and there is no proof or suggestion that there is any known artificial oxide that will not answer the purpose. Upon every ground, therefore, I arrive at the conclusion that the plaintiff's specification is good, and, consequently, the plaintiff's patent must be held to have been conclusively established at law. There remains still the question whether the process of the defendant was an infringement of the plaintiff's patent? The defendant, however, has not desired to contest that before me. He has been content, and wisely so, with reference to the short duration that still remains of the plaintiff's patent, to abstain from raising that question. The fact of the infringement, therefore, is conceded by the defendant. I have, therefore, only to declare that so much of the bill as makes any case, or seeks any relief, on the ground of the agreement, which was come to between the parties of the 4th of November, 1860, is dismissed. I declare the plaintiff's patent to have been conclusively established at law, and to be valid and good in law. I grant the injunction, as prayed in the first paragraph of the prayer of the bill; and, considering the case as falling altogether under the provisions of the Statute of 1852, I direct the plaintiff's costs to be taxed as between solicitor and client of the whole of the suit, save that part of the bill which is founded on the agreement of November, 1860, and except the costs of the application to the Lords Justices, and the hearing before them, as to which I give no costs to either party. That will be the whole of the decree, unless the plaintiff prefers, instead of the account, to have liberty to bring an action at law, for damages, which he may take in lieu of the account. If not, I direct the account as prayed, which, of course, will be prosecuted in the chambers of the Vice-Chancellor, to whose court the cause is attached. The costs of that account and inquiry, if it be taken, will be reserved.

Mr. GROVE: My lord, we elect to take the account, and not to bring an action.

The LORD CHANCELLOR: Very well.

COURT OF COMMON PLEAS.

MONDAY, JAN. 27.

(*Sittings in Banco before the Lord Chief Justice* ERLE, *and Justices* WILLIAMS, WILLES, *and* KEATING.)

WYATT *v.* METROPOLITAN BOARD OF WORKS.

In this case, the plaintiff, who acted as parliamentary agent for the delegates by whom the Metropolis Gas Act 1860 was promoted, sued the defendants under the 56th section of that Act, by which the costs, charges, and expenses of and incident to its passing, and preliminary thereto, were directed to be paid by the Metropolitan Board of Works out of such funds as might be levied by their authority from the several vestries and district boards of the Metropolis. After the passing of the Act, a large demand was made by the plaintiff for professional charges, &c., which, on taxation, was considerably reduced. The board had an intimation that certain sums of money had been paid on account, to the claimant, Mr. Wyatt, and that some disputes had arisen between him and the delegates of the vestries and district boards with respect to it. The board, therefore, refused to pay, and the plaintiff brought his action. The defendants, under the advice of counsel, put in a special plea, in which Mr. Wyatt's right of action against the board was denied. Plaintiff demurred to this plea, and the case came on for argument a few days ago.

Mr. PRENTICE and Mr. J. D. COLERIDGE appeared in support of the demurrer, and Mr. J. GRAY and Mr. RAYMOND on the other side.

Lord Chief Justice ERLE, in delivering judgment, said, he was of opinion that the plea of the defendants in this case was a good one. The action was brought by the plaintiff under the Act 23 and 24 Vict., cap. 125, which was "An Act for better Regulating the Supply of Gas to the Metropolis," the 56th section of which provided that "the costs, charges, and expenses of, and incident to, the passing of this Act, and preliminary thereto, shall be paid by the Metropolitan Board of Works out of such funds as may be and shall be levied by their authority from the several vestries and district boards," &c. The plaintiff was employed as parliamentary agent by certain persons who were not named on the record, but who were the promoters of that Act, and were liable to him for his services in respect of what he did in obtaining the passing of it. He now sued the Metropolitan Board of Works for those expenses under the section referred to. The court were of opinion that the promoters of the bill, and who employed the plaintiff, were the parties liable to him for what he did towards the passing of the Act, and that the promoters against whom he had a claim were the parties who ought to sue the present defendants. The Metropolis Gas Act was a peculiar Act, differing from many of the Acts incorporating gas companies, wherein the parties who were the promoters were for the most part the leading persons of the gas companies, in which case, upon the passing of the Act, it was right that out of the funds of the company the expenses attending it should be paid, those funds in reality being funds in which the promoters were chiefly interested. But those cases differed from the one now in question, for here the whole of the gas companies in the metropolis were the parties to be blended together and amalgamated under this Act in respect of the supply of gas to the metropolis, and the costs of obtaining the Act were cast upon a set of entire strangers (for so the Metropolitan Board of Works were to be considered), who had power to levy rates on the inhabitants of the Metropolis—strangers for the purpose of the present observation to the gas companies and those interested in the manufacture of gas. Was it intended by the Act that every person who rendered any service towards the passing of it should have a right to sue the Metropolitan Board of Works for payment of the same? The consequence of such a proceeding would be so very inconvenient that he (the Lord Chief Justice) could not help thinking the intention of the Legislature was different. In the case, as put by Mr. Gray upon the present occasion, the plaintiff had been paid by the parties who were his clients the sum allowed by the speaker's certificate.

Mr. COLERIDGE said that was not so.

Lord Chief Justice ERLE said Mr. Gray so stated it, whether correctly or not, he did not know. The case he was about to put was this: a parliamentary agent who had a right of action against the promoters of a bill, by whom he was employed, might be paid by them the sum allowed by the speaker's certificate; but, having another debt due from the same parties, unless this sum was specifically appropriated at the time it was paid to him, he might say, "I have a right to appropriate it to another debt, and will sue the Metropolitan Board of Works for the costs of passing the Act." At the same time, the promoters who had employed him and had intended to pay those costs, would have a cause of action against the board for the same expenses. It might or might not be a question as between the parties both interested, whether this were the truth or not. If the judgment was to be for the plaintiff, there would be, as far as he (the Lord Chief Justice) conceived, a further question beyond that of who were primarily liable for the expenses of obtaining the Act, for in addition to the action by them, if they paid those expenses, an optional action by any one who had done some service towards its passing, and it would be excessively inconvenient, that the party who had to pay, should be removed one off from the contractor, by whom the claim was made, and so be doubly liable, absolutely, strictly and literally, whether the demand on him was actually due under the contract or not. If the parliamentary agent could sue, then the law-stationer, and various other persons, who had done anything in the course of the proceeding which were essential towards the passing of the bill, would have a right also to sue; and, unless the promoters happened to be in connexion with the Metropolitan Board, and gave them full information to enable them to make a defence, they would be helpless as to knowing whether they could resist the claim made against them. The promoters of the bill were the parties liable to the persons employed for the costs of promoting it, and they would receive the sum total from the Metropolitan Board.

Justice WILLIAMS said, he was of the same opinion. He thought, if the plea was amended in the way suggested, all doubt being removed as to the question, whether the plaintiff was employed by a certain number of persons, he was not entitled to recover. The persons who employed him, must be taken now, on the record, to be the persons who incurred "costs, charges, and expenses," and, alone, were entitled to recover them under the Act.

Justice WILLES said, he was of the same opinion. The sums to be paid by the Metropolitan Board of Works, were, "the costs, charges, and expenses of, and incident to the passing of the Act, and preliminary thereto." And certainly, at first sight, it would seem that the word "costs," which was an expressive word, referred to the parliamentary agent, that the parliamentary agent was the person who ordinarily would be paid by persons made liable under the section, and, certainly, it distinguished the case from that of *Tilson v. the Warwick Gas Company*, that action having been brought by a person under a similar section, and he recovered from the persons who were to pay. But in none of the cases had it become material to decide this question. In *Tilson v. the Warwick Gas Company*, the declaration was very like the declaration in this case, and no person raised the question there, whether the solicitors, or their agent, who had been employed by the promoters, was the right person to sue for what might be due to him from the promoters, or whether the promoters being the persons ultimately liable, were not the proper persons to bring the action? It might be that in that case, there really was no payment to be made by any one to Tilson, in case of failure in obtaining the Act, or in case the Act was obtained, with such a knowledge as enabled him in that case to recover his costs from the company, so that it became immaterial whether he brought the action or not, or whether he might sue all the persons; so, clearly the person to bring the action would have raised the question. That case was material in this form of declaration, on the retainer and employment of another person. It might he said that the court declined to draw inferences that Tilson was not the person interested; and, as the declaration in this case was in similar language, it would be too much for the court to assume, on the declaration only, that Mr. Wyatt was employed by the promoters of the bill, to be paid by them in the ordinary way in which a parliamentary agent was paid. But he (Justice Willes) thought that the whole argument before the court proceeded on the assumption that Mr. Wyatt was to be so paid. In the argument, it was most material that that fact should be placed on the record, and that was the reason why the court directed the amendment. Mr. Gray having decided to amend his plea, it stood that, while the plaintiff was employed, he was retained and employed for hire and reward by the promoters; and that the "costs, charges, and expenses were incurred by him by reason of such retainer and employment, and due from, and payable by, such persons," &c., which appeared to be a material circumstance, showing the importance of putting in an amendment, which set up a defence. He (Justice Willes) thought, for the reasons given by the Lord Chief Justice, this did set up a defence, for it showed that the persons who would have to pay the "costs, charges, and expenses," sought to be recovered, if the Metropolitan Board of Works did not pay them, would not be Mr. Wyatt, because he might have a remedy against his clients. Those clients were the persons ultimately to pay; and, unless they did so, he was entitled to sue for the whole sum, under the 56th section of the Act: and the great inconvenience already pointed out by the Lord Chief Justice would unquestionably follow. He thought that, notwithstanding the general words, "costs, charges, and expenses," putting a reasonable construction upon the 56th section, it must mean the "costs, charges, and expenses," of the persons who would ultimately have to pay them. Therefore, the action ought to be brought by Mr. Wyatt's clients, and not by himself; and any inconvenience arising must be settled between themselves. The Metropolitan Board of Works would pay one person, and that person would settle with Mr. Wyatt.

Justice KEATING said, he was of the same opinion. The plea, no doubt, as a plea of tender, would have been a bad plea; but the amendment which had been made, altered entirely the form of the plea and the complexion of the case, because it got rid of any apparent difficulty which might have arisen from the case of *Tilson v. The Warwick Gas Company*. In truth, the present state of things was very different from that which existed there, because it would be difficult, in reading the 56th section of the Metropolis Gas Act, to suppose that when the Legislature deemed it right that a public fund, under the control of the Metropolitan Board of Works, should ultimately bear the expense, they intended, nevertheless, altogether to destroy the many difficulties which existed between the parties promoting the bill and the persons the plaintiff employed. The state of things which was exhibited on the record, would itself show the inconvenience of any such legislation; because, what appeared on the record was this: that the persons who employed the plaintiff made certain payments to him, which he claimed to appropriate in a parliamentary way. The dispute, therefore, in looking to them, would be whether he had a right so to appropriate them? It was difficult to say that the Legislature would have intended that a question of this description was to be contested between Mr. Wyatt and the Metropolitan Board of Works, who could have no knowledge on the subject. For the reasons given, more particularly by the Lord Chief Justice and Mr. Justice

Willes it seemed to him that the plea, as amended, furnished an answer to the plaintiff's demand, and that the persons to sue were the persons who employed the plaintiff, and not the plaintiff himself.

Judgment for the defendants.

THURSDAY, FEB. 6.

(*Sittings in Banco, before Justices* WILLIAMS, WILLES, BYLES *and* KEATING.)

THE GREAT CENTRAL GAS CONSUMERS COMPANY *v.* CLARKE.

Sir FITZROY KELLY, Q.C., with Mr. LUSH, Q.C., appeared for the plaintiffs; and Mr. RUSSELL GURNEY, Q.C. (the Recorder of London), Mr. BOVILL, Q.C., and Mr. C. POLLOCK for the defendant.

Sir FITZROY KELLY said, the question submitted to the court, in this case, was one of considerable importance to the several gas companies supplying the City of London with gas, and to the whole of the inhabitants of the City of London itself. The question involved in it arose upon certain provisions contained in two Acts of Parliament, one of which was passed in the year 1851, and the other in the year 1860. It appeared that for many years the City of London had been supplied with gas by several companies, of which the plaintiffs' was one, which companies were incorporated under several Acts of Parliament, containing provisions affecting the quality of the gas to be supplied, and the price to be charged for the same. They also contained a number of other regulations differing from each other, and it appeared to be the object of the Legislature, in the Act of 1860 (the Metropolis Gas Act), to render all those provisions and regulations uniform, and so to provide for the supply of gas by the several companies in the City as to do justice to the companies, on the one hand, and in the most convenient, reasonable, and just manner, to provide for the wants of the City, on the other. The question which arose in this case, the sole question, as he apprehended for the court to determine was this—under the Act of Parliament of 1851, providing for the supply of a portion of the City with gas by the plaintiffs, the quality and description of gas which they were bound to supply were specified and defined as gas equal in illuminating power to 12 wax candles, and for the supply of this description of gas the plaintiffs were limited to the price of 4s. per 1000 cubic feet. Under the Act of 1860, the gas which they, as well as the other gas companies of the metropolis, the regulations being uniform, were bound to supply was of a finer and more expensive description, equal in illuminating power to 12 sperm candles; and the question now raised was, whether, inasmuch as instead of 12 wax-candle gas they were now bound to supply gas equal in illuminating power to 12 sperm candles, they were nevertheless still to be limited to the price of 4s., at which they were bound to supply the inferior quality—whether, in fact, the Legislature had enacted that, whereas it was formerly thought a reasonable bargain between the company and the public—the inhabitants of the City of London—that they should supply 12 wax-candle gas at 4s., they should now be required to supply 12 sperm-candle gas, which was from 7 or 8 to 15 per cent. better in quality at the same price? That being the question to be decided, the facts of the present case were these:—This was an action brought by the plaintiffs against the defendant for the recovery of £11. 4s. 5d.; and, by the consent of the parties, and by an order of the honourable Mr. Justice Williams, dated the 9th day of January, 1862, according to the Common Law Procedure Act, 1852, the following case has been stated for the opinion of the court without any pleadings:—

First.—The City of London is supplied with gas by three companies—the Chartered Company, the City Gaslight Company, and the Great Central Gas Consumers Company.

Second.—The Chartered Company was established in 1809, and was regulated by the following Acts:—namely, the 54th George 3, chap. 116; 56 George 3, chap. 87; 57 George 3, chap. 20; and the 4th George 4, chap. 119.

Third.—The City Gaslight Company was established in 1817, and regulated under the Act 23 and 24 Victoria, chap. 52.

Fourth.—The Great Central Gas Consumers Company was established in 1849, and regulated under the Act 14 and 15 Victoria, chap. 69, passed in 1851.

Fifth.—The districts of these companies are defined in the Act mentioned in section 6 of the Metropolis Gas Act, 1860, and with that of the Commercial, include the whole City.

Sixth.—These Acts, and the tracing from the said map which accompany the case, may be referred to as part of the case.

Seventh.—The standard of illuminating power mentioned in section 23 of the Great Central Company's Act of 1851 (namely, 12 wax candles) was, at the time the Act passed, deemed and taken to be, and is, in fact, equal to 10·41 sperm candles of 120 grains, and not more.

Eighth.—Under and in accordance with the provisions of the said Act, the Great Central Company did, from and after the time when the same came into operation, and until the 29th of September, 1861, produce and supply to their consumers common gas above the said standard, sometimes above and sometimes below an illuminating power of 12 sperm candles of 120 grains, at and for the rate and price of 4s. per 1000 cubic feet, save in the case of any special contract.

Ninth.—In June, 1859, the Great Central Company made and entered into a contract with the Commissioners of Sewers of the City of London, being the local authority of the said City, to supply the public lamps within the jurisdiction of the commissioners, for three years from the 24th of June, 1859, which contract was made and existing before the 1st day of January, 1860, and at the time of the passing of the Metropolis Gas Act, 1860.

Tenth.—From and after the making of the said contract, the company, in accordance therewith, until the 29th day of September, 1861, supplied the commissioners and their other customers with gas above an illuminating power of 12 sperm candles of 120 grains.

Eleventh.—On the 1st of January, 1860, and from thence until the 29th of September, 1861, the rate taken and charged by the Great Central Company for gas was 4s. per 1000 cubic feet.

Twelfth.—Before the 2nd day of September, 1861—namely, on the 1st day of September, 1861—the plaintiffs and the other two companies elected to adopt the provisions of the Metropolis Gas Act, 1860, relating to price, purity, and illuminating power of gas, on and from the 29th day of September, 1861, pursuant to the provisions of the said Act.

Thirteenth.—Having so elected, the chairman of the said three companies on the 2nd of September, 1861, with the authority of the directors of the said companies, signed and sent to their customers the following circular:—"The Legislature having, after full inquiry, passed an Act for regulating the supply of gas to the metropolis, requiring, under heavy penalties, a greatly-increased standard of illuminating power and purity, which will necessarily involve an increased cost of production, we beg to inform you that the companies supplying the City of London with gas, will, on and after Michaelmas next, be brought under the provisions of that Act, and that the future charge will be at the rate of 4s. 6d. per 1000 feet for the ordinary coal-gas."

Fourteenth.—Such circular was sent by the plaintiffs to the defendant, and received by him on the 2nd of September, 1861.

Fifteenth.—On and after the 29th of September, 1861, the plaintiffs, in pursuance of the Metropolis Gas Act, 1860, and their election to adopt it, have manufactured and supplied their customers with gas of, and above the standard purity and illuminating power of the common gas required by the said Act of 1860, and no other—namely, 12 sperm candles of 120 grains—and contend that they are entitled to charge at or for the rate or price of 4s. 6d. per 1000 cubic feet.

Sixteenth.—The standard fixed by the said Act is higher than the standard fixed by the Great Central Company's Act of 1851.

Seventeenth.—The production and supply of gas of the standard required by the Act of 1860, involves an increase in the cost thereof over and above the cost of production and supply of gas of the standard fixed by the Act of 1851, which increase may be taken, for the purpose of this case, at 3d. per 1000 cubic feet.

Eighteenth.—The defendant, who occupies premises in the City of London, and within the plaintiffs' district, has, on and since the 29th of September, 1861, consumed by meter 31,800 cubic feet of gas to December 18, 1861, manufactured by the plaintiffs of, and above the standard purity and illuminating power of the common gas required to be supplied by the Act of 1860; the plaintiffs have charged him 4s. 6d. per 1000 cubic feet for such gas. He contends that they cannot charge more than 4s. per 1000 cubic feet. The defendant has paid for such gas at the rate of 4s. per 1000 cubic feet; and the only question in dispute is, whether the plaintiffs are entitled to charge more than 4s. per 1000 cubic feet?

The question for the consideration of the court is, whether the plaintiffs are entitled to charge 4s. 6d. per 1000 cubic feet for common gas consumed by meter of, and above the purity and illuminating power required by the Metropolis Gas Act, 1860, supplied to the defendant since the 29th of September, 1861; or, whether the plaintiffs are not precluded from demanding and receiving more than 4s. per 1000 cubic feet by the 24th section of their Act?

If the court shall be of opinion that they are so entitled, and are not so precluded, the judgment to be entered for the plaintiffs for 15s. 10d., and the costs of suit on the higher scale.

If the court shall be of the contrary opinion, judgment shall be entered for the defendant, with costs as aforesaid.

In reference to the 6th paragraph in the case, the learned counsel stated that, before the passing of the Act of 1860, the various companies supplied gas by means of pipes running parallel with each other throughout the entire City, each company, therefore, being able to supply any given part thereof. But, by this Act, which he might call the Consolidation Act, the City was divided into districts or portions, one of which was assigned to each of the companies—a very convenient mode of affording a supply, and which was no doubt one of the objects contemplated by the Act of Parliament. In reference to the 8th paragraph, he observed, that he understood the meaning of it to be, that in order to insure the specific quality of gas required by the Act of Parliament—*i. e.* equal to 10·41 sperm candles—it was necessary to work up to a rather higher standard, and therefore the plaintiffs made their gas equal to 12 sperm candles of 120 grains. He had stated to their lordships what was the single question in this case, and that it depended, as he believed, entirely upon the construction of the Act of 1860. With respect to the earlier Act—the Act of 1851—he believed there were only two sections that were material—viz., the 23rd and 24th; the first determining the quality of the gas to be supplied by the Great Central Company, and the second the price to be charged by them. By the former, the company were required to supply 12 wax-candle gas, by the latter they were limited to a price not exceeding 4s. per 1000 cubic feet. The only question for the court would be, whether the Act of Parliament of 1860, which required all the metropolitan companies to supply a superior and more expensive description of gas—viz., 12 sperm-candle gas—required the plaintiffs, as one of the companies named, to supply it at the rate prescribed by their own Act for the lower quality gas, or whether they were not brought wholly within the provisions of the Act of 1860, and, therefore, entitled to charge the rate prescribed by that Act? He (Sir Fitzroy Kelly) contended for the latter construction, and that while the plaintiffs were required to supply gas of the quality prescribed by that Act, they were at liberty to charge according to the scale of price, and subject to the regulations affecting price, which were to be found in that Act. His learned friend, on the other side, would contend that, because there were no words in the Act of 1860 which in express terms repealed the clause of the Act of 1851, affecting price, they were still bound on that point by the provisions of that Act. He would call attention to five or six of the material clauses of the Act of 1860, to show that the object, and the legal effect of the language and provisions of the Act was to introduce one uniform system of regulation, both as to quality and as to price as affecting the whole of the companies supplying gas in the City of London. The intention of the Act was to be implied from the recital, and it was unreasonable to suppose that the Legislature, finding one company supplying gas of a certain quality and description should impose upon them the obligation to increase their standard of illuminating power, and still to limit them to the price at which they had been supplying the inferior gas. The recital of the Act, after naming the several companies incorporated under various Acts, and supplying wholly or in part the City of London, proceeded to say, "Whereas the regulations to which those companies are subject are not uniform, and whereas it is expedient that provision be made for the due regulation of all companies and persons supplying gas within the metropolis," &c.; and then followed the enacting parts of the Act. Passing over several of the earlier clauses, which were not material to the present question, the effect of which was, first, to assign districts to the several companies, and then to give a power of superintendence and control to the Secretary of State, &c., he came to the 14th section, which was material for two purposes—first, because it made it compulsory upon the companies to supply gas at the request of any occupier, within their respective districts, not heretofore supplied; and, secondly, that they were obliged to supply it of the superior quality named, "at the rate prescribed in this Act." The 37th clause provided that the companies should not charge a higher price for gas supplied to the public lamps than the lowest rate per 1000 cubic feet from time to time charged by them to any private consumers. But, if the contention on the other side was correct, the company would be obliged to supply the public boards with the superior gas prescribed by this Act, at a price not exceeding 4s. per 1000 feet. The second part of the 14th section contained a provision, which was only one of several, showing clearly that it was the intention of this Act to make the regulations affecting all the companies, uniform, not only as respected the quality of their gas, but also the price charged by them, and that the provisions of the plaintiffs' Act of 1851 were at an end. After enacting that every company supplying gas within any district shall, as to premises or streets within such district not already supplied with gas, and which shall lie within fifty yards of any existing mains, be compelled on request of the owners or occupiers, on their contracting to pay so much on the outlay, to lay down all proper and sufficient communication, service, and other pipes, up to the premises of such owner or occupier; the clause proceeded, "and shall, if so required by the owner, occupier, or local authority, furnish him or them, at the rate prescribed by this Act, with a supply of gas, &c." Now, what would become of those words as applicable to this company, if still under the 24th section of their own Act of 1851, as to price, they were imperatively and absolutely forbidden in any case, no matter what description of gas was supplied by them, at a price not exceeding 4s.? And, not only in this clause, but in every other where the regulations affecting price were alluded to, it was manifestly the intention of the Legislature that this company and all the others should be brought under the provisions of the Act of 1860.

Justice WILLES inquired whether, before the passing of the Act of 1860, the maximum price of all the companies was 4s.?

Sir FITZROY KELLY said it was not; for even in the City an Act was passed in 1859 by which the maximum of the City Gas Company was fixed at 5s.

Justice WILLES: Was that 12 wax-candle gas?

Sir FITZROY KELLY said, it was 12 sperm-candle gas; but he alluded to the fact of the price to show the want of uniformity in this respect. The Chartered Company, which also supplied a portion of the City, had no limit at all either as to illuminating power or price, and could supply 12 wax-candle gas, and charge 5s., or whatever other price they could prevail upon their customers to give. Now, with reference to the clauses he had read, their lordships would find that it was not merely inferential or a matter of implication, but an express provision that, when the company was called upon to supply gas for the first time, they must supply the superior description "at the rate prescribed by this Act." Therefore, as respected new customers, that clause at once put an end to the 24th section of the earlier Act of Parliament. And it must be remembered that the Legislature, in adopting this language, intended, as appeared by the recital, to make the regulations of the companies uniform. But, if the contention on the other side was correct, then in one district, or a part of one district, the consumers would be paying 4s. and in another 5s. for precisely the same description of gas, which would at once put an end to one of the great objects of passing the Act. The next provision to which he called attention was the 19th, which was very important, because it in express terms enacted in what way, not only as respected price but also all the terms, the companies might enter into contracts for the supply of gas. They were to be "on such terms and conditions as the parties agree, but subject to the provisions of this Act." The 48th section limited the price, which, under any circumstances, was to be required. The effect of these clauses was, that the companies were henceforth to supply only the superior description of gas; that their contracts were to be made upon such terms and conditions as the parties could agree to, but that, if at the time of passing the Act any company were receiving 4s. 6d. per 1000 or upwards, they must continue to supply gas at the same price, and not increase it. He submitted that these clauses disposed of the earlier Act—an event which might reasonably be expected to take place, when Parliament, coming to deal with a question of this kind, found it in a state of doubt, uncertainty, and confusion. The first provision of the 40th section was a very remarkable one, and might require a moment's pause and consideration. It certainly seemed—if they might hazard a conjecture upon the intention of an Act of Parliament—as if the Legislature, finding that different prices had been charged, as well as different descriptions of gas supplied, they had fixed upon what they thought the most proper description, and required thereafter that it should be of one quality, the fair price for which they considered would be 4s. 6d. They then went on to prescribe the ultimate limitation, which applied to all the companies, and to any description of supply, under whatever circumstances—viz., 5s. 6d. What he contended on behalf of the plaintiffs was, that, taking the whole of these four sections together, and the section which substituted the superior for the inferior gas, it simply came to this, that the companies which previously had been charging less than 4s. 6d., and supplying, perhaps, an inferior and cheaper species of gas, were permitted to charge 4s. 6d. thereafter, or any other price they could agree upon up to 5s. 6d.; and those who had hitherto been charging 4s. 6d., were to continue to charge 4s. 6d. and no more, unless under the circumstances provided for in clause 40. But his learned friend on the other side would contend that, though the Act imposed upon the plaintiffs the supply of the better quality of gas, which was worth 15 per cent. more than what they had been bound to supply under their own Act, they were to be compelled to supply it at 4s. still. The court would observe, not only in the clauses which he had read, but in all others of the Act of 1860, in which not only price, but every other subject of regulation was referred to, it was "this Act," and not any former Act which was to regulate it. It was, as he had before remarked, no matter, therefore, of implication; the court were not called upon to draw inferences as to the intention of the Legislature. Here were express provisions following upon a recital of a want of uniformity in such matters hitherto applicable to all the companies.

Justice WILLES asked, whether any of the companies supplied cannel gas prior to the Act of 1860?

Sir FITZROY KELLY said, the company which he represented had never done so; and he believed it was not supplied at all in the City. In dealing with the 40th section, he had almost forgotten to notice a curious proviso which it contained. It was that, if any of the companies thought fit to change the supply from common to cannel gas, they could do so by giving notice of their intention; and, having done so, they could return after a similar notice to the supply of common gas; "and, when the company shall change the supply from cannel gas to common gas, the rate shall be reduced so as not to exceed 4s. 6d. per 1000 cubic feet." It certainly seemed clear from this that the intention was that 4s. 6d. should be the price; and, if the plaintiffs were to take the course of changing from their old quality of gas to the supply of cannel gas, and subsequently to change the supply back again to common gas, they would be strictly and literally within the meaning of the Act by charging 4s. 6d. per 1000. The 21st clause of the Act of 1860 enacted that "No contract for any of these purposes (public lighting, &c.) shall contain any term or condition contrary to any of the provisions of this Act." It was not the provision of any former Act, but "the provisions of this Act" which the Legislature contemplated as governing and regulating every contract made. There was a provision that all existing contracts should terminate on the 1st of February, 1862, or earlier; and it was remarkable that, with regard to all future contracts, there was nowhere anything to lead to the supposition that it was in contemplation to regulate them according to the provisions of any former Act. Then, the 25th section related to the illuminating power and purity of the gas in future to be supplied: and, for the purpose of this case, it was taken that the actual increased cost of production was 3d. per 1000 cubic feet.

Justice BYLES said, the question was, whether the greater light was to be supplied at the same expense as the less light?

Sir FITZROY KELLY said, no doubt that was so. What was the effect of this increased light upon the interests of the company? An increase of 3d. upon 4s. was 7½ per cent. upon the price. The company were limited as to dividends to 10 per cent, so that, in point of fact, it would take away within a fraction, nearly the whole of the profits of the company, supposing them to be still restricted to the price fixed by the Act of 1851, for, except in very prosperous times, the profits of the company rarely exceeded 7½ per cent. The thing became still more striking when they considered the difference between 4s. and 4s. 6d. It was 15 per cent, when they looked at the difference between the one description of gas and the other. If it was supposed, which he thought it was not unreasonable to suppose, and for the purpose of this case it might be taken at 3d., their lordships would find that whereas the gas originally supplied was of 10·41 sperm-candles illuminating power, the gas now required to be supplied was 12 sperm-candle gas—a difference of 1·59, or a superiority of more than 1½ candle. If, therefore, the cost of production bore, as no doubt it did, a proportion to the intensity of the light produced, it was a difference of fully 15 per cent. And this article, the cost of which was 7½ per cent., and the value to the public 15 per cent. more than that formerly supplied, was to be sold, according to the arguments on the other side, at the same price. Undoubtedly, Parliament was omnipotent, and might enact anything; but, it appeared to him, that unless the Legislature had said "Notwithstanding anything in this Act contained, the Act of 1851 shall still regulate the price of gas," the court would never admit the construction of the learned counsel for the defendant. There was only one other clause to which he would refer, and that was the 36th, relating to the determination of existing contracts, and the exemption of the companies from the operation of the Act until the 1st of February 1862, unless in the meantime they should elect to adopt it. The plaintiffs had done so; and therefore they came within the terms of the clause. He referred to it only for these two purposes—first, as showing the intention of Parliament, that all future contracts should be regulated by this Act.

Mr. RUSSELL GURNEY: No, not as to price.

Sir FITZROY KELLY said, the concluding words of the paragraph were that until the time stated, "the provisions of this Act relating to price purity, and illuminating power of gas, shall not apply to any such company." What was the inference to be drawn from that? Why, that from the present time, or from the time when the company elected to adopt the Act, those provisions were to apply. It was impossible to resist the inference. Having called their lordships attention to all the material clauses in the Act, he concluded by submitting that it was the clear intent of the Legislature that, from the time of the adoption of the Act, that, and that alone, should regulate the description of gas to be supplied to the inhabitants of the City of London, and also the price, or scale of prices, at which that gas should be supplied; and, therefore, the plaintiffs were fully entitled to the judgment of the court.

Mr. RUSSELL GURNEY said he appeared on the part of the defendant in this case nominally, but in reality he was instructed by the Commissioners of Sewers, to appear on behalf of the consumers of gas in the City generally. He was very much amused that his learned friend should have dwelt so much upon the question of hardship, that his clients were compelled to spend an extra 3d. in the production of the gas required to be supplied under the Act of 1860, while he made that the foundation upon which they ought to be allowed to charge the public 6d. beyond the sum at which the company had solemnly contracted to supply the consumers. He certainly thought that those who were trying to avail themselves of certain words in an Act of Parliament, to get out of a solemn contract entered into with the authorities of the City of London and the consumers of their gas, and to charge them at least double that which they said was the extra burthen thrown upon them, were not quite in a position to talk about hardship, and to call upon the court to put such a construction upon the Act as they had been contending for. He could not conceive that, when this Act of Parliament was carefully looked at, there could be any doubt that the provisions of the Great Central Act, 1851, as to price were still in force. It would appear that, some short time before the Act of 1851 was obtained, the Great Central Company had been under certain disadvantages, in consequence of not having legislative powers, and they had entered into a contract with the local authorities of the City of London, by which certain privileges were to be granted to them on certain terms, the terms of which were subsequently embodied in the Act of Parliament, upon which he now relied. That Act of Parliament introduced various regulations for the benefit of the consumers which had not been introduced previously, one of which provisions was, that the gas should have an illuminating power of 12 wax candles, which was equivalent to the light of 10·41 sperm. It introduced likewise the provision in the 24th section, that the price for any gas supplied by the company to any person consuming the same by meter should never exceed the sum of 4s. In return for that, the company got great privileges which they would otherwise never have had. There could be no question that, up to the time of the passing of the Act of 1860, they were bound by the terms of that Act. The question, therefore, was whether by the later Statute the provisions of the earlier one were repealed, and the company were now at liberty to charge for the gas which they supplied a higher sum than 4s.? It must be remembered that the Act of 1860 did not apply to this company only, but to some twelve or fifteen others supplying gas, not in the City of London only, but some of them in comparatively remote districts, which were totally different in character and warranting a different price being charged in them, although the same description of gas might be supplied to all. Their lordships were perfectly aware of the nature of the expense which arose before gas could be conveyed into the houses of the consumers. The manufacturing expense was small; the great expense was in the conveying and distributing of the gas from the place where it was manufactured to all parts of the district intended to be supplied. Therefore, when his learned friend (Sir F. Kelly) talked about 6d. or 3d. upon 4s., it was not correct; it was an increase of 3d. upon 1s., or upon 6d.; the 4s. including, not only the cost of manufacture, but interest upon the original outlay at the works, and the expense of distributing the gas throughout the company's district. The manufacture of the gas was but a small portion of the expenditure, and if 4s. remunerated the company for the gas supplied before, a very small additional sum would remunerate them for the increased illuminating power they were now required to supply. For the purpose of this case, it was assumed that the cost was 3d. Not that the actual expense of manufacture was greater now than in 1851, because since then great improvements had been introduced, by which the economy of manufacture was promoted. Originally, when the first company, mentioned in the Act of 1860, was established, the price of gas was 15s. Since then, it had been gradually reduced, in consequence of improvements introduced into the manufacture, tending to diminish the cost of production. It was reasonable, therefore, that gradually there should be incorporated into Acts of Parliament provisions for a reduction of price, and, where it had not been done by the Legislature, the same effect had been produced by the force of competition. Accordingly, they found that in the City of London it had been reduced to 4s. He was not aware that in any other part of the metropolis it was so low; but the reason was that in the City every house was a shop or a warehouse; and the expense of supplying gas there was much less than in a comparatively thinly-inhabited district. That was one reason why it would be most unreasonable and unjust, if the effect of the Act of 1860 introduced one stated and uniform price for all the metropolitan companies, throughout the whole of the districts supplied by them. No such injustice, however, was intended, or, as he should submit, had been perpetrated by the Legislature. He would now come at once to that Statute, and ask what was to be considered the fair meaning and intent of it? His learned friend had stated that it was unreasonable to suppose the Legislature would compel the company to supply a superior article at the price fixed before by their Act of 1851. He (Mr. Russell Gurney) would venture to suggest that it was not at all unreasonable, because the expense

of manufacture was continually decreasing; and what was a fair price for one article in 1851, might be a perfectly fair price for a superior article in 1860. The case before the court found that this very company, who were required to supply 10·41-sperm-candle gas, had, in fact, been supplying, for 4s., gas of 12-sperm-candle quality, sometimes above and sometimes below, in consequence of the competition which existed. The City of London Gas Company, who obtained an Act in 1859, had their standard fixed at 12 sperm candles; and, indeed by the year 1860, that had become the gas commonly supplied to the citizens.

Justice WILLES asked what the maximum price of the City Gas Company was?

Mr. RUSSELL GURNEY said it was 5s.; but that was a perfectly reasonable maximum for that company, whose works were peculiarly situated, and who were established at an early period, before the improvements in the manufacture of gas were introduced. But, in point of fact, that company had only charged 4s. until recently. These facts the Legislature had before them when they passed the Act of 1860. What was the object in view in passing that Act? It was to benefit the companies as well as the public. The recital referred to one of those benefits: "The said companies, instead of supplying gas by several mains in the same district, have agreed, as far as possible, each one to confine its supply to a separate district, in order to economize capital, and avoid the too frequent opening of the public streets; and, subject to the provisions and restrictions of this Act, it is expedient that such districting should receive the sanction of Parliament." Those who were at all familiar with legislation upon the subject of gas, knew that, if there was one thing more than another which the companies desired for their own benefit, and which the public were unwilling to grant them, it was that of assigning to each company a separate district, instead of continuing that wholesome competition which had hitherto prevailed, and which had led to those improvements by which the price of gas had been reduced from 15s. to 4s. In the City of London, the pipes of the three companies were lying side by side, but if, in future, each company were confined to a separate district, they would be able to obtain the same rental as at present, with one-third of the quantity of mains. Well might they afford to supply gas of a superior quality in return for such an advantage! It was in return for this monopoly which they asked Parliament to sanction, that they agreed to certain limitations which had not before existed. Strange would it be if, when the thing was granted, they should be able to impose an additional tax upon the consumer, in return for the diminished expense and economy of capital it enabled them to effect. His learned friend said that the object of the Legislature, as shown in the preamble, was to introduce uniformity of legislation. No such thing appeared in the preamble. There was no suggestion that it was even desirable. The recital was important, as showing that at the time Parliament had before them the fact that the several companies were supplying gas under different regulations; but there was no suggestion in the preamble where the intention of the Legislature was to be looked for, that it was intended in future to make those regulations uniform. Still less was there any suggestion that the price of gas supplied by the different companies should be uniform. The preamble went on to state that, "It is expedient provision should be made for the due regulation of all companies and persons supplying gas within the metroplis." There was no doubt of that, but it was not desirable to have a uniformity of price throughout the metropolis, because the expenses of one company were far greater than the expenses of another, arising sometimes from the fact of the time at which they were originally called into being, but, more frequently from the character of the district in which the gas was supplied. The Legislature, as he had said, were aware of the different regulations of the various companies, and that one company were limited to a price not exceeding 4s., and another 5s., and yet there was not in the preamble, nor in the clauses of the Act, any words from which the inference could be drawn that in future those prices should be uniform. Indeed, he would show presently that it clearly contemplated their being different. His learned friend in referring to the 14th section, had spoken of "the rate prescribed by this Act." He would ask his learned friend to point it out. There was no such rate prescribed whether it was the intention of the Legislature or not, and therefore they must give a general meaning to those words. Of course, they were to be consistent with the regulations of the companies' Acts of Parliament, which the Legislature knew to be in existence, and which still remained in force unless distinctly repealed by this Statute. The only section in the Act which made any reference to price was the 40th, and it was from that section his learned friend inferred that "the rate prescribed by this Act" was 4s. 6d. Now, he apprehended that this section could not in any way affect the company, who had their powers under the Act of 1851, because the provision was that "no company shall advance the price of gas above the rate taken by such company on the 1st day of January, 1860, whenever such rate is at or above 4s. 6d."

Sir FITZROY KELLY: That, I agree, does not apply to this company.

Mr. RUSSELL GURNEY said, if his learned friend's argument was right, the Great Central Company, which hitherto had been bound down to a lower price than any other company, had now the right to charge more than any other, because the only limitation which would apply to them was that contained in the proviso, "that no gas company shall charge for common gas supplied by them any sum exceeding 5s. 6d.," while those companies which were charging 4s. 6d. or 5s. could not raise their price above the former sum without proving to the satisfaction of the Board of Trade, or some other authority, that there had been "such increase in the cost of gas, or any other circumstance affecting the company, as will warrant such advance." He could not conceive of anything more unreasonable.

Justice BYLES: What do you understand by the expression in the 14th section, that the company shall be under obligation to furnish gas to any person "at the rate prescribed by this Act?"

Mr. RUSSELL GURNEY: Those who enter into that proviso undertake to pay an amount equal to 20 per cent. upon the outlay.

Sir FITZROY KELLY: That does not mean the price of the gas.

Mr. RUSSELL GURNEY said, of course it did not; but, if the parties paid 20 per cent. upon the outlay, it would be a good bargain for the company. If there were a higher price prescribed by the Act, it would be reasonable that in those particular cases the parties should pay it. But he confessed that, looking at the word "prescribed" in the strict and ordinary sense, he could find no price prescribed in the Act.

Justice KEATING: Would it not follow from your construction that, even if the circumstances existed which would justify an advance upon the part of those companies which had charged more than 4s. 6d. before the Act passed, in the case of the plaintiffs they could not make any advance?

Mr. RUSSELL GURNEY said, it certainly would, but the company took their Act under that condition, in exchange for the privileges which they obtained, and their position was not in any way altered. They did not come within the terms of the 40th section, which applied only to companies who were charging 4s. 6d. and upwards.

Justice BYLES asked whether, in the Metropolis Gas Act as introduced originally into Parliament, there was any substantive proposal as to the price of gas?

Mr. RUSSELL GURNEY said, he obtained a copy of the original bill on the day previously, and could not find such a provision. No doubt, the history of the bill was a very curious one, and, if gone into, it might account for some things that had been introduced and others which had been omitted from the Act.

Justice BYLES: As you read the Act, there is no rate prescribed?

Mr. RUSSELL GURNEY: No rate, in the strict meaning of the word.

Justice BYLES: Then, do you contend that the company are bound to supply the better gas at the old rate, or that there is anything implied by which they can charge a proportionate advance?

Mr. RUSSELL GURNEY: Certainly not. They are obliged to supply the better gas at the old rate, in consideration of the advantage they get in economizing their capital by the districting.

Justice BYLES: It is like delivering by the Winchester bushel, instead of the imperial, at the same price.

Mr. RUSSELL GURNEY: They have a corresponding advantage.

Sir FITZROY KELLY: You say so.

Mr. RUSSELL GURNEY: It is not I who say so, but the companies who say they have come to the arrangement with that view, and therefore there is nothing unreasonable in imposing upon them the additional burthen, supposing it were one. But it is not proved in any way to be one. There is nothing in the case from which I can infer that there is a greater expense in manufacturing this gas than in manufacturing the inferior gas required by the Act of 1851.

Justice KEATING: If that is so, will not this extraordinary anomaly exist in the case of the City Company? The 40th section prescribes that there shall be no advance unless there are certain circumstances which justify it. But, if your construction is correct, the City Company may go to 5s., though only charging 4s. before, without any such circumstances existing at all.

Mr. RUSSELL GURNEY said, his friend contended that the Central Company could go from 4s. to 5s. 6d. without giving proof of any change of circumstances. Surely, it never could be the intention of the Legislature that the company, originally limited to 4s., should, without a change of circumstances, be allowed to charge 5s. 6d. What was there to show that the Act of 1851, was repealed by the Act of 1860? The authorities were strong as to what was required in a subsequent Act, in order to get rid of the provisions of a former one. It was impossible to state more strongly than the judges had done, the extreme impolicy of introducing anything which was not distinctly found within the four corners of the Act. His learned friend did not say there was any express provision in this case to that intent: he only argued as to its reasonableness, and that there were certain provisions which seemed to show that it was intended. The learned counsel proceeded to quote several authorities on the subject; amongst others that of Dwarris, to the effect that it was always to be presumed, when the Legislature entertained an intention of the kind, they would express it in clear and explicit terms. Here, there were no such terms, nor was it a necessary implication from the sections to which his learned friend had referred. The view he entertained of the two Acts of Parliament was, that by the first the company obtained certain privileges for which they bound themselves to certain terms; that by the second they obtained certain other privileges, in return for which they agreed to accept the additional obligation of supplying gas of a higher quality. There was nothing in the latter Act from which it could be inferred that the Legislature intended to alter the conditions of the former; and there was no unreasonableness in their being kept to their original limit of price. He submitted, therefore, that the 24th section of the Act of 1851 still remained in force, the company not being able to point out that it had been repealed. The two Acts could stand together; they were not inconsistent with each other; there were no words of express repeal in the latter, and there were no words of repugnance between the two. In reference to the question put by the court, a short time previously, he found that he had given a wrong answer. The Metropolis Gas Act, as originally introduced, did contain a substantive provision as to the price of gas. It was to be 4s. for gas of 12 sperm-candle illuminating power, and 5s. for a higher quality.

Sir FITZROY KELLY having been heard in reply, the learned judges (Justice Williams having retired from the court) consulted for a short time.

Justice WILLES, in delivering judgment, said: Having reference to the important interests involved in this case, the court allowed it to stand first, and out of its order, for consideration at the present sittings, and the same reason which induced the court to accede to the application of the parties that it should be first heard, also induces the court to think that if they feel they have arrived at an opinion upon the construction of the Act of Parliament, they ought to announce that opinion at once, and not to impair any proceedings which the parties on either side may think proper to take elsewhere, by any delay in the matter. The court have arrived at an opinion upon the construction of the Act of Parliament, in which not only the members now present, but also my brother Williams concur. The question arises in this way: it appears that the gas supplied to the metropolis was supplied by a great number of companies; that those companies—many of them—competed with one another, especially upon the boundaries of the districts which they respectively supplied. Those companies were regulated by a variety of Acts of Parliament, which Acts of Parliament were not consistent with one another in their provisions. With respect to the principal matter under consideration—viz., the price to be charged for gas—the variety of provisions consisted in this: some companies, as in the case of the company who are the plaintiffs in the present action, were obliged to supply gas of a certain quality at a certain price—4s. per 1000 in this case; another company were obliged to supply gas of a superior quality at another price—viz., 5s. per 1000; other companies had no limit whatever upon the price which they might charge for the supply of their gas, and the gas supplied by such companies was supplied like any other article of commerce in the market, at the price which it would fetch, or which, in the particular instance, the company might be able to obtain from the persons to whom they contracted to supply it. Therefore, there was a variety as to the sort of gas to be supplied, and a variety as to the price which was to be paid for it. Before the Act of 1860 was passed, the companies appear to have agreed that it was better, so far as they could do so, to cease from expensive competition with one another; that each company should confine itself, so far as it could be arranged, within certain limits appointed by the Statute. But that was far from being the only object which the Act of Parliament had in view, because, notwithstanding the ingenious argument of Mr. Recorder, it is impossible to leave out of consideration the statement in the recital, that the regulations to which those companies were subject were not uniform; and it is also impossible to sup-

pose that that recital would have appeared in the Act of Parliament if it had not been one of the objects of the Legislature to make uniform those regulations which the Act recited were not so at the time when that Act was passed. Looking at the fact that those companies were supplying, in one district and another, what is now a necessary of life, it was to be supposed that the Legislature, in dealing with them, would endeavour to make the regulations affecting those districts uniform with respect to each of the companies. One of the provisions of that Act of Parliament is remarkable. In the first place, it makes a general provision with respect to the sort of gas which is to be made by all the companies coming within the operation of the Act; and that section provides for two sorts of gas, one of which is called common gas, and the other cannel gas. The first species of gas referred to in the Act is the sort of gas which formed the standard of excellence in one or more of the Acts of Parliament which affected companies, other than the company—the plaintiffs in the present action; but that standard was extended beyond that which this company's Act required them to attain, and for which, under that Act, they were to charge 4s. per 1000. I refer here to the 23rd and 24th sections of the Great Central Company's Act, and to the 25th section of the Metropolis Gas Act. You have, therefore, by the latter a standard of quality introduced which is a different standard to that which existed in the Act of the company; and the expense of producing that species of gas is higher than the expense of producing the gas which by their own Act they were required to supply. To say the least of it, it is not unreasonable to find a general provision with respect to all the companies, nor is it astonishing if we find a provision that this company should charge, in respect to this superior article, a larger amount than for the inferior article they were required to supply under the provisions of their own private Act. I say no more, at this stage of the case, upon that point, except that I do not throw out of consideration what was urged by Mr. Recorder—that the companies do, under the Act of 1860, acquire considerable benefits—amongst others, a better use of their capital, by the remedy it gives against competition with each other. In considering that, we must, however, remember that that is a benefit derivable to them from the arrangement previously come to one with another, and only confirmed to them by the Act of 1860. It is a benefit which reasonably flows from their own act in coming to that agreement, and for which one does not see that it necessarily follows that they are to be charged anything for the benefit of the public generally. That consideration, in no view of it, detracts from what I have stated, that there is nothing unreasonable in supposing that they should be allowed to charge more for the better gas required to be supplied by them than for the inferior. So much with respect to the thing produced, and which is a general provision, affecting all the companies, some of which must seek the power to charge, and must be bound by the limit of the charge provided in the Act of 1860. Well, now, we have, in the Act of 1860, a class of persons who unquestionably are to be governed in their dealings with the company by the provisions of that Statute—I mean the class of persons pointed out by section 14. With respect to them, the company are bound to supply them with gas upon certain terms which are laid down, and one of which is to "furnish him or them at the rate prescribed by this Act." You come, therefore, to the consideration of the 40th section, with three lights thrown upon its construction. First, the reasonableness, or, at least, the not unreasonableness of the company being allowed to charge more for the better article—the unreasonableness of charging 4s. equally for the common gas and for the cannel gas; secondly, the fact that general provisions are made with respect to all the companies, some of which must be governed by section 40 only; and, thirdly, the provision with respect to the class of persons coming under section 14, and the fact that no substantial difference has been pointed out between the case of those persons, and the case of persons supplied previously to the Act being passed. I have endeavoured in vain to find—no doubt the arguments of Mr. Recorder would have supplied it had it existed—any reason for giving a preference to persons supplied after the passing of the Act. If there is no reason, the 14th section throws a light upon the subject. Then we come to the 40th section, and it is most important here. I find it provides that "no company shall advance the price of gas above the rate taken by such company on the first day of January, 1860, whenever such rate is at or above 4s. 6d. per 1000 cubic feet, unless there has been such an increase in the cost of gas, or any other circumstance affecting the company, as will warrant such advance." That being the provision of this Act of Parliament, it must, as it appears to me, govern the dealings of this company after the passing of the Act; and, if that provision is inconsistent with the 24th section of the former Act, it therefore repeals it. I do not assent to what was laid down by Dwarris, that to repeal a former Act there must be express words repealing it. It is sufficient if there are words which either expressly or by implication repeal the former Act. The latter words are necessary to make that law which has been read to us. It is a necessary implication here. If the company are to charge a certain rate not exceeding 5s. 6d. for gas A, and 7s. 6d. for gas B, gas C not being supplied at all, that is a provision inconsistent with the terms and practical provisions of the former Act. Is there any reason why that principle should not be applied to this case? Is there any absurdity which will follow from making that the rate prescribed in section 14 of this Act of Parliament? After giving much consideration to it, I am satisfied that there is no such absurdity. I certainly did at one time incline to think that it would be absurd if the company, who charged on the 1st of January, 1860, 4s. 6d. for their gas, should be precluded from raising the price of their gas unless there had been such increase in the cost of gas, or any other circumstance affecting the company, as to warrant such advance; and that other companies who charged less—as this company did—than 4s. 6d., should be at liberty at once to raise the price to 5s. 6d.: and that does appear to be so, if you read the first six lines of section 40. But it will not be so when you read the proviso which follows, because the proviso is this:—"Before raising the gas-rate in any district, the gas company supplying such district shall give notice of their intention to the local authorities of the district, and, in some newspaper circulating within the district, for two consecutive weeks, at least one month before such alteration in the gas-rate shall be made; and in case any local authority shall, within such month, dissent from such alteration, it shall be determined by arbitration in the manner hereinbefore mentioned, whether such alteration shall be allowed." That proviso is applicable generally, as it appears to me, to any company raising its rate, whatever that rate may be on the 1st of January, 1860. If the price is at or above 4s. 6d., it must not be raised unless the circumstances referred to in the first clause of the section occur: but, whatever it may be, it must not be raised without notice; and not then if, upon reference to arbitration (which, by the best construction I can give the Act, appears to me to be a reference to the inspector to be appointed under the 7th section, and whose award is to be carried into effect in the manner prescribed by the 7th to the 12th clauses, inclusive), it should appear that the raising of the price is unreasonable. No doubt, if the price was raised above 4s. 6d., the arbitrator would look at the legislative declaration in the earlier part of the section, and not allow it to be raised unless there had been such an increase in the cost of gas, or other circumstances affecting the company, as would warrant such advance. That seems to reconcile the whole matter; this proviso introduced in the middle of the section operating in the way mentioned. Now follows the provision which appears to me strongly to confirm this view, because it is not that no gas company should charge so and so. That would be inconsistent with what was stated by Mr. Recorder, that no company shall charge more than 4s.; but, here follows a proviso which is not capable of being explained in that manner; that, "any company (that is, any company mentioned in this Statute) shall be at liberty to change the kind of gas from time to time supplied by such company, whether common or cannel gas, on giving three months notice of their intention so to do, and, upon the expiration of such notice, the company shall thenceforth supply gas pursuant thereto under the provisions of this Act, until any like notice shall be given for a further change; and, when the company shall change the supply from cannel gas to common gas, the rate shall be reduced so as not to exceed 4s. 6d. per 1000 cubic feet, except under the circumstances and in the manner hereinbefore set forth." This clearly is general, and is applicable to all the companies. It would be absurd if applicable to this company, if 4s. were the maximum charge for the new species of gas, for the argument must go the whole of that length to be a valid argument. Having paid the best attention I could to the matter, and to the able arguments addressed to us, I am now quite satisfied that that is the true construction of the Statute, and that the plaintiffs are therefore entitled to recover the increased rate.

Justice BYLES: I am of the same opinion, and, I confess that, from an early stage in this argument, it appeared to me that the plaintiffs were entitled to the judgment of the court, though I was for some time embarrassed by the able arguments of the Recorder, the defendant's counsel. I apprehend that one of the authorities which he has cited, and, indeed, a higher authority could not be cited, lays down one exception to the rule which he quoted as to the effect of a subsequent Act of Parliament, that though not directly repealing a former Act, the former Act is repealed, if there be an invincible contrariety or repugnance between the two. The question here is, can any one read the 23rd and 24th clauses of the Act of 1851, without seeing that they must be repealed by the Act of 1860? The 23rd section defines light of a certain intensity, gas of a certain quality, which, for this purpose, and for the sake of brevity, I may call inferior gas, and it enacts that that quality may be supplied, but lower than that cannot be. The new Act of Parliament enacts that this inferior gas shall not be supplied at all, and that alone appears to me to dispose of the argument, that the 23rd and 24th sections of the Act of 1851 are unaffected by the latter Act of 1860. Indeed, otherwise, we should arrive at this conclusion, that the company would be obliged by the tyranny of an Act of Parliament to sell, for the same price, a much more expensive commodity. That being so, one looks to see whether any new rate is introduced into the new Act of Parliament. A comparison of the sections, and the observations of Sir Fitzroy Kelly, induced me to suspect there must have been in the Act of Parliament originally a scale of charge. I do not form my opinion at all upon that, but it seems that my suspicion was not altogether unfounded. But still it is plain that it is somewhere to be found, because section 14 speaks of "the rate prescribed by this Act," and there is another clause which, though not in the same language, is just as expressive, the 36th section which says, "provided that from the time of the passing of this Act until the said 1st day of February, 1862, the provisions of this Act relating to price, purity, and illuminating power of gas, shall not apply to any such company, unless such company shall elect to adopt them." I took the liberty to ask the Recorder where the provisions were to be found. He could call the attention of the court to no part of the Act of Parliament, except the 40th section, and, therefore, I apprehend, though it is not necessary to decide that question, the provisions of the 40th section are substantially, enactments as much as the original clause is, as to the price of gas. There is such a provision in the Act of Parliament, but it is nowhere to be found except in the 40th section. I confess I was, with my brother Willes, much bewildered by the provision that, where companies had charged a rate above 4s. 6d. per 1000, they might still charge 4s. 6d., and no more; but, where they had been in the habit of charging a sum less than that, they might go as high as 5s. 6d. But I am much disposed to think that the explanation given by Sir Fitzroy Kelly on this point is the true one. It was supposed that companies charging the small rate were in the habit of delivering a very inferior quality of gas, and, therefore, the higher provision was necessary to compensate them when required by Act of Parliament to supply gas of such high illuminating power as is here prescribed; but, in fact, it is of no importance to decide that question, for this reason, that, whether this is a proviso or a substantial enactment, the effect is exactly the same. But, further, it may well be a proviso to the subject on this record, for what is it a proviso upon? It is a proviso upon the fitness of the price of gas. For these reasons, it appears to me that the plaintiffs are clearly entitled to the judgment of the Court.

Justice KEATING: I am of the same opinion. I must confess that, during a portion of the argument, my opinion on the subject fluctuated a great deal. I was much struck by many of the observations and the arguments adduced by the Recorder in the course of his able address, but I have come to a conclusion which entirely coincides with that at which the rest of the court have arrived. Now, it is not necessary that I should repeat what has been said by my brother Willes, in reference to the object and intent of this Act of Parliament. I entirely agree with him, that it is impossible to exclude from our consideration, in looking at the Act of Parliament, that portion of the preamble which refers to the want of uniformity among the existing companies to be affected by the provisions of this Act, and though, undoubtedly, the construction of the Act is not unattended with difficulty almost naturally consequent upon the changes which an Act sometimes undergoes in its passage through the Houses of Parliament, yet I think the construction at which the court has arrived will reconcile most, if not all, of the difficulties which have attended it. It would seem almost impossible to read this Act of Parliament without arriving at the conviction that the Legislature intended clearly, at all events, to affect the price mentioned in former Acts of Parliament. No doubt, I quite agree that, where a prohibition upon a public company not to take beyond a certain rate, is enacted by Act of Parliament, we should see our way clearly, by a subsequent enactment, before we remove that prohibition. But I quite agree also that, if we find in the latter Act of Parliament provisions which are utterly inconsistent with the former, we must give effect to the latter. Now, in addition to the section to which my learned brethren have referred, for the purpose of showing that the Legislature, in this Act, must have conceived that there was a rate or price of gas prescribed—in addition to the 14th section, which refers to "the rate prescribed by this Act"—and to the 36th section, which has been re-

ferred to by my brother Byles—I would also refer to the 35th section, which appears to me to provide, or, at least, to refer in terms to a rate prescribed by the present Act, because it says (this is the prohibitory clause in reference to the limit of charge for gas and meters), "After the 31st day of December, 1860, no gas company shall, except under existing contracts, demand or take for any gas or 5-light meter supplied by them any sum of money exceeding the rate or meter-rent by this Act authorized." Now, undoubtedly, it might at first suggest itself that that applied altogether to meters and meter-rent; but it will be observed that not only does it apply to any "gas or 5-light meter," but it goes on to say, "any sum of money exceeding the rate *or* meter-rent by this Act authorized." It seems to me that, without doing any violence to the construction, the "rate" there may apply to gas and "meter-rent" to meters. But even without that section, I think, the two sections referred to are sufficient to show that the Legislature conceived that a rate had been prescribed by this Act of Parliament. Then, upon turning to the 40th section, I think that certainly does prescribe a rate. I shall not repeat the analysis of that section already given by my brother Willes, but only add that I entirely agree with him in the observations he made. For these reasons, I think the plaintiffs are entitled to our judgment.

Miscellaneous News.

CITY OF LONDON GASLIGHT AND COKE COMPANY.

The Half-Yearly Meeting of the Proprietors in this Company was held at the Works, in Dorset Street, on Wednesday, Feb. 5—ROBERT ALEXANDER GRAY, Esq., in the chair.

The notice convening the meeting having been read, the corporate seal was affixed to the register.

The SECRETARY (Mr. R. J. Millar) read the minutes of the last half-yearly meeting, which were approved. The following report and statement of accounts were then presented:—

Gentlemen,—Your directors have again the mournful duty to commence their report by announcing the death of one of their colleagues, James Cousens, Esq. It will be remembered that he was elected deputy-chairman about two years since on the death of the late Samuel Sangster, Esq., and he expired on the 4th of December last, after a short illness, having occupied a seat at the board since the year 1846.

Pursuant to the powers given to them by the Companies Clauses Act, your directors have elected J. Hadland, Esq., to be deputy-chairman. The same Act, as you are aware, also gives them power to fill up for the time being the vacancy at the board; but the death of Mr. Cousens having taken place so short a time before the half-yearly meeting, they have preferred to follow the course adopted on the death of Mr. Sangster, and now leave it to this meeting to fill up the said vacancy.

The only candidate who has offered himself is Robert Kenneth, Esq., and, should it be your will to elect him, your directors will have much pleasure in welcoming him amongst them.

The death of Mr. Cousens, leaving only one surviving trustee of the loan-fund created in 1854, and seeing that the company's Act of incorporation renders the continuance of that fund no longer necessary, your directors have decided that it is expedient that it should be closed, and that there should be issued, in exchange for the certificates held by the subscribers, debenture bonds, under the borrowing powers of the company. They are happy to say a large proportion of the subscribers have readily fallen in with this arrangement, and your directors confidently anticipate that ere long the fund will be finally closed. One bond for £500 has been issued during the half year.

Your directors have also to report the death, on the 28th of November, of Mr. Gaines, the company's former engineer, to whom, in 1853, you were pleased to grant a pension of £150 per annum.

In their last report, your directors drew your attention to the low price at which gas was being supplied in the City of London as being totally inadequate to sustain a suitable dividend, and to cover the liabilities to which every gas company is subject. Further consideration led them to resolve, in accordance with the powers of the Metropolis Gas Act, 1860, on raising the price to 4s. 6d. per 1000 feet from Michaelmas last, being the rate charged almost universally throughout the metropolis.

The proprietors are probably aware the Commissioners of Sewers have deposited a bill in Parliament, having for its object to exempt the City from the operations of the said Act.

Your directors purpose carefully to watch and oppose this bill, and they feel assured the Legislature, having, after a very protracted investigation, passed an Act for regulating the supply of gas to the entire metropolis, will not consent to exempt any one portion thereof from its operation.

Your directors have also, in accordance with the said Act, caused a room to be fitted up at 61, Hatton Garden, with the necessary meter and apparatus, for the purpose of affording opportunity for the company's gas being tested by the proper authorities.

Your directors further report that a bill for the embankment of the river, founded on the report of Her Majesty's Commissioners, has been deposited in the House of Commons; it will be the duty of your directors very closely to watch the progress of this bill through Parliament, to insure that the privileges of this company are not affected.

The accounts for the half year, duly certified by the auditors, will now be submitted. The rental for that period is £39,659. 4s. 4d., being an excess over that of the corresponding period of 1860 of £587. 2s. 2d. Notwithstanding that the coals consumed are nearly 1000 tons less, this decrease is attributable to the mildness of this winter as compared with 1860-61, and will account for the rental not exhibiting the increase which, from the additional charge during the last quarter, might have been anticipated.

The net profit for the half year, as per No. 1 statement, is £9180. 4s. 9d., being an excess of nearly £1700 on that of Christmas, 1860, although, during the half year, extensive alterations, involving an outlay of upwards of £1000, have been effected.

The amount now at your disposal, per No. 2 statement, is £11,225. 8s. 3d., subject to income-tax; and, out of this, your directors recommend you to declare a dividend for the half year as follows—viz., on the A and new shares, at the rate of £7 per cent. per annum; and, on the B shares, at the rate of £4 per cent. per annum, in accordance with the Act of Parliament—the whole to be payable at the company's office, free of income-tax, on the first Tuesday in April, and on each succeeding Friday and Tuesday, between the hours of twelve and one o'clock.

Your directors close their report by adverting to the overwhelming calamity which has recently occurred at the Hartley Colliery, for the purpose of suggesting, in consideration of the close connexion of gas companies with the coal trade, that you will deem it fitting to give expression to your sympathy with the bereaved families, by a vote in aid of the fund now being raised for their relief.

R. A. GRAY, Chairman.

Dr. *Statement of Profit and Loss, for the Half Year ending Christmas*, 1861. *Cr.*

To Cost of coals consumed, including porterage	£19,275	13	10	By Rental	£39,659	4 4
Rents, rates, and taxes	663	13	4	Coke	8,369	18 4
Wages	8,561	9	0	Breeze	295	6 9
Directors and auditors fees	500	17	0	Liquor	404	0 6
Salaries	2,030	0	0	Tar	1,441	13 9
Tradesmen's accounts	7,557	3	11	Old materials, &c.	622	8 1
Repairs and depreciation of meters	897	9	8	Transfer fees	4	15 6
Petty cash disbursements	627	16	10			
Interest	1,130	5	2			
Bad debts, &c.	372	13	9			
Balance	9,180	4	9			
	£50,797	7	3		£50,797	7 3
				Balance of profit brought down	£9,180	4 9

Dr. *General Balance-Sheet, Christmas*, 1861. *Cr.*

To Capital	£364,000	0	0	By Plant		£349,382	13 9
Loan-fund, with interest to date	18,659	6	1	Leasehold property		5,184	0 0
Debenture bonds, ditto	26,081	8	3	Cash paid on account of works in progress		21,794	11 2
Reserve-fund	8,557	12	0	Amount due for light	£31,189 5 5		
Mr. Benham's benevolent-fund	1,000	0	0	Ditto coke, &c.	5,492 2 4		
Debts due to sundries	24,989	9	11	Ditto sundries	586 16 2		
Balance carried down	11,225	8	3			37,270	3 11
				Amount of cash in hand	£4,115 19 1		
				Ditto petty cash	4 3 1		
				Ditto City gas shares	2,641 0 0		
						6,761	2 2
				Stock on hand—			
				Coals, &c.	£8,313 12 2		
				Materials	2,505 8 8		
				Meters	23,301 12 8		
						34,120	13 6
	£454,513	4	6			£454,513	4 6
				Balance of profit brought down		£11,225	8 3

J. T. HADLAND, S. T. PRIOR, *Auditors.*

The CHAIRMAN: Gentlemen, I shall now, according to my practice on former occasions, proceed to make some remarks in connexion with the report just read. It would have been more gratifying to my feelings if I could have congratulated you upon a greater increase in the divisible profits, but, as I cannot do so, I must remind you of one circumstance which may help to explain the reason. You will remember that, last year, we were engaged in erecting our large new gasholder, and it will readily present itself to your minds that, in the execution of that work, considering the limited space we have at command, there would be a great deal of additional labour thrown upon the company. I have no doubt that the additional labour so occasioned amounted to nearly £1000, which, of course, has diminished your profits to that extent. In addition to that, our rental is less, for the reasons assigned in the report—viz., the mildness of the weather, which has again affected the half-year's profits. But, notwithstanding these little disadvantages, we feel great confidence that we are going on in a state of progressive prosperity. All persons connected with gas-works know that these little fluctuations must be expected. I need not assure you that every practicable economy is adopted by your directors in these works, in order to secure to you as beneficial a result as possible. It will be our duty, as long as we have the honour to enjoy your confidence, to pursue the same course that we have hitherto done, and, I trust, with at least equal success. (Hear, hear.) There are two or three items in the accounts to which I might refer. For instance, there is the charge for repairs and depreciation of meters—£897. 9s. 8d. for the half year, or from £1800 to £2000 per annum—which is almost needlessly taken out of your profits. That has arisen in consequence of the arrangement entered into by the Great Central Company to supply their consumers with meters gratuitously. By the Metropolis Gas Act, however, which passed through Parliament in 1860, we are enabled to exercise a discretion as to charging meter-rent for the future. Whether it will be advisable to do so or not, depends upon circumstances. It is sometimes expedient to concede a little to the prejudices of the public, and I do not know that there is any disadvantage in it to the company; for, in the peculiar position in which they are placed, it is their paramount duty to conciliate the good feelings of their customers. To a great extent, we have always been successful in so doing. With reference to the advance in the price of gas, you have the small advantage of the addition during one quarter; and, I may say that we do not expect anything to occur which will prevent our continuing to realize the additional 6d. per 1000 cubic feet, which the Act of Parliament authorizes us to charge. You are aware that some difficulties have arisen between the Commissioners of Sewers and the Great Central, as to whether that company are empowered to raise the price under the Metropolis Gas Act; and, I may inform you, that they have agreed upon a case for the opinion of the Common Pleas as to the construction of the Act, which now waits for the decision of that court. You are also aware, from the report, that the corporation of London have given notice of an application to Parliament with a view to exempt the City from the operation of the Metropolis Gas Act. I cannot think for one moment, that the Legislature, seeing that the Act occupied nearly a month in consideration, will consent to repeal the provisions which were only a session or two ago deliberately

agreed to. I think the probability is, that they will require the corporation of London to wait and see the working of that measure; and if, at some future time, it should be found that its enactments are prejudicial to the citizens, to apply again for its amendment. We shall of course offer our opposition to any alteration of the Act, and, I have reason to hope that that opposition will be successful. (Hear, hear.) Of one thing you may be assured, and that is, that we will not neglect the interests of this company. We have had many trying circumstances to pass through, but we have generally succeeded in the end in accomplishing the object we had in view. I believe the Metropolis Gas Act is one which ought not to be objected to, for while on the one hand it gives a just and reasonable remuneration to the companies for the capital embarked in their undertakings, on the other hand it secures to the citizens of London and the gas consumers of the metropolis generally, a proper and sufficient supply of gas under heavy penalties. The 6d. per 1000 additional, which it empowers us to charge, is about 12½ per cent. increase in price, while the increased illuminating power, which we are required to give, is from 14 to 16 per cent., so that instead of being injured in the slightest degree, the consumers receive a more than equivalent advantage. I can assure you, as a fact, that many of our customers have informed the collecters, that they are aware of the benefit, to a certain extent, which they have derived since the Act came into operation. We seldom meet with any objection; they pay their accounts most cheerfully, and are satisfied with the arrangement. I think it is not at all unlikely that the fact of our rental not being so large may arise from the gas being better in quality, and to that extent rendering a less quantity necessary for the consumers. (Hear, hear.) Well, then, gentlemen, with respect to the recommendation of the directors, to grant a sum of money in aid of the poor people in the north, who have been so suddenly deprived of their husbands or sons, upon whom they depended for support, and of the children left fatherless by the recent calamity (I believe that the number of persons thus thrown upon the charity of the public, without any resources of their own is 422), it is almost unnecessary for me to say one word in reference to their claim upon your liberality. You know that we are much indebted to the bold adventurers who work in the coal-pits of our country. There is no body of men more entitled to our sympathy in the event of an accident. (Hear, hear.) They work in an atmosphere which has a tendency to shorten their lives, and are exposed to vicissitudes to which few others are subject. It does appear to me, therefore, that on an occasion like the present, when so many of the poor fellows have met an untimely end, that it is the duty of the proprietors in a gas company to show their sympathy for their bereaved and suffering families, and to do all in their power to alleviate their distress, and help to make some provision for their need. (Hear, hear.) These men could earn probably 6s. a day, by working in the mines, and of that means of support their families are now deprived. Our gracious Queen, you are aware, has exhibited the greatest sympathy for them, and has, while suffering from a heavy bereavement herself, condescended to express practically her desire to aid their distresses by nobly contributing £200 to the fund for the relief of the sufferers—(Hear, hear)—and I cannot but think that Her Majesty would have considered the vote of £500 in aid of the memorial to the Prince Consort, by the corporation of London, very much enhanced in value had they voted a similar sum to meet the exigencies of these afflicted people, instead of the small sum of £100 which has been reported. With reference to this subject, I read in the newspapers of to-day, with feelings of regret, that the Lord Mayor at the Mansion House has stated that he considers the public sympathy has extended far enough; and I am at a loss to understand upon what he can base such a conclusion. It must be obvious that, even if the fund has reached £30,000, that sum when invested will produce but a very inadequate amount for the bereaved families, and to reward those noble fellows who risked their lives in efforts to extricate the poor fellows who were buried in the mine. My hope is, that the fund raised will not only be sufficient to relieve the present wants of these people, but also to make some provision for their future need. (Hear, hear.) I trust you will concur in the proposition of the directors, and vote such a sum as you may deem proper; for, respecting the claims of these people upon our sympathy, I think there cannot possibly be two opinions, the circumstances of the case standing almost alone in the history of our country. The effect of the public generosity towards these people will be to encourage and stimulate those who thus expose their lives in such perilous undertakings, and they will feel that, should accident overtake them in the discharge of their duty, those who are dependent upon their exertions for a livelihood will not be cast penniless upon the world. I do hope, too, that the occurrence of this sad calamity will lead to some measures being taken to avert as far as possible the repetition of such a catastrophe. Such measures will probably involve the coal-owners in greater expenses, which will eventually fall upon the consumers; but, whatever those expenses may be, I am sure that every one will rejoice if they succeed in placing the poor miners in a position of greater security. (Hear, hear.) I will not now trespass further upon your time beyond saying that I shall be happy to answer any questions which may be proposed, so far as I can do so, with a due regard to the interests of the company. I beg to move, "That the half-yearly report of the directors now read be received and adopted."

Mr. Howell seconded the motion.

Mr. Maughan: There was a passage in the report about the extinction of some fund which I did not clearly understand.

The Chairman: You were not a proprietor at the time it was created. We had no power under our former Act of Parliament to raise any more money, and, as we wanted funds, the plan adopted was to create a loan-fund, and a deed was executed, authorizing the issue of certificates, and placing in the possession of the three trustees who signed it securities to indemnify the subscribers for the amount raised. Two of those trustees are dead. I am the only surviving one, and it does not appear desirable to the directors that the certificates should remain in circulation. By our new Act, we can raise £60,000, and the parties who hold those certificates, which expire in three years, are willing to exchange them for bonds having ten years to run.

The Secretary: It will be transferring the amount from the loan-fund, which the proprietors assented to in 1854, to ordinary bonds of the company under our new Act.

Mr. Box: I was rather surprised at the remark made in reference to the rental of the company. I do not think it is to be looked at in that light. I consider that we have improved very considerably in our rental for the past half year upon the gas that has been made. But, before I refer to that, I would ask, how is it we have had to pay more for our coals during that period than for the corresponding period of 1860? It appears to me to be 8½d. per ton more, or £840 in the gross.

The Chairman: The coals carried over from the past half year stood us in much more than in the previous corresponding period. Then, again, we paid more for freight, and the price of coals has also been a little higher. I know that our contracts have been made as satisfactorily as those of any other company in the metropolis or the country at large.

Mr. Box: It is a matter for congratulation that our rental has increased £1952 over and above what the coals produced in the corresponding period of last year. That shows that our engineer has been quite awake to his duty, for it is an improvement of nearly £8 on every 100 tons. There is one thing, however, that I am sorry to see, and that is, there is an increase in the unaccounted-for gas of 1 per cent. I was in hopes that, after we got our new gasholder, there would be a diminution in this particular.

The Chairman: I do not dispute your figures, but you must know that it is morally impossible to keep within 1 per cent. one way or the other. There are escapes of gas which take place occasionally, over which we have no control. For instance, a main gets broken now and then, and we lose a quantity of gas without any neglect on our part. I think it must be satisfactory to find that it is no more than 1 per cent.

Mr. Box: Upon a review of the whole of our affairs, looking at them in a comprehensive point of view, I think we are in a very favourable condition.

A Proprietor: Do the company hold any shares of their own?

The Chairman: Yes; we have held 50 shares for a long period of time. When the price was low it was not expedient to dispose of them. We are parting with them by degrees, which will rather give us a profit than a loss.

The motion for the adoption of the report was then put and carried.

Mr. Ward: I have much pleasure in moving the following resolution—"That, agreeably to the recommendation contained in this day's report of the board of directors, a dividend out of the profits of this concern, for the half year ending Christmas last, be now declared as follows:—on the A and new shares, at the rate of £7 per cent. per annum, and on the B shares, at the rate of £4 per cent. per annum, the whole to be paid free of income-tax at the company's office on the first Tuesday in April next, and on each succeeding Friday and Tuesday between the hours of 12 and 1 o'clock." I must say that, considering the exceptional circumstances of the half year, the mildness of the weather, and the works we have had in progress, the accounts which have been presented to-day are such as give me very great satisfaction.

Mr. Box: I second the motion, but I do not know what the mildness of the weather has to do with the question of rental.

Mr. Hadland: It has a great deal to do with it. A large number of buildings are warmed with gas, and, therefore, so much is not required in a mild season.

The motion was carried unanimously.

The Chairman: Reverting to one paragraph in the report, which has been read in relation to the vacancy that has occurred in the direction, I have to express the deep regret with which we have to record the loss we have sustained. It is but right I should state that, during the time Mr. Cousens was associated with the company, no person could have been more anxious to perform his duty than my deceased friend. (Hear, hear.) For the reason stated in the report, the half-yearly meeting being so near, we considered it respectful to the proprietors at large to waive the power which we have under our Act of Parliament to fill up the vacancy. I knew sometime ago, that Mr. Kenneth was desirous of a seat at the board. He was a candidate before, but as Mr. Lamb, who had been an auditor, was in the field, he considered that gentleman had a preferable claim, and he gave way, at the same time intimating that on a future occasion he should offer himself for the appointment. From the knowledge I have of Mr. Kenneth, I believe that, if elected, he will efficiently perform the duties of a director, and, therefore, I do not think it inconsistent with my position, to propose him now as a fit and proper person to occupy a seat at the board. (Hear, hear.) I, therefore, move—"That Robert Kenneth, Esq., be elected a director of the company, in the room of the late James Cousens, Esq."

Mr. Perry seconded the motion.

Mr. Ward supported the motion, believing that Mr. Kenneth would, as the chairman had intimated, prove a valuable addition to the board. He had intended, himself to come forward as a candidate, and intimated that, on the occasion of a future vacancy, he should ask the suffrages of the proprietors. It was unseemly to speak of his own qualifications for the office, but he felt that the large stake held by him, and his immediate family circle, and the experience which he had had in connexion with gas companies, would be accepted as some guarantee, that, if elected, he would bring a considerable amount of interest and knowledge to bear upon the affairs of this company.

Mr. Hardwick said he was glad to hear of Mr. Ward's determination to offer himself at the next vacancy. It was most important in a company like this that, in the event of a sudden vacancy occurring, the proprietors should not have to cast about for a fit and proper person to fill it, but should look forward beforehand, and make such a selection as, in the event occurring, would best conduce to their mutual interests. Having long known Mr. Ward's family, and his own personal qualifications, he was gratified to think that at some future time he would be elected by the proprietors to a seat at the board.

The motion was put and carried unanimously.

Mr. Kenneth: Gentlemen, allow me in the first place to say that I most fully sympathize in the remarks of Mr. Hardwick with regard to Mr. Ward, and I rejoice that he has expressed his intention to offer himself as a candidate on a future occasion. Allow me, in the next place, to say that I appreciate very highly the honour you have just conferred upon me by electing me to a seat at the board of this increasingly-important undertaking, and to assure you that my most assiduous attention will be given, in connexion with our excellent chairman and the other gentlemen who have so long and deservedly enjoyed your confidence, to promote the interests of the company. (Hear, hear.)

Mr. Hardwick: Gentlemen, there is one part of the report which it is now my duty to advert to by the kind permission of the chairman and directors. And I do not know that I have ever, since my connexion with the company, had a motion to propose for your acceptance which I could submit with greater satisfaction to myself. We must all feel—indeed, the feeling is universal—the utmost sympathy for the sufferers by the frightful calamity which has occured in the north, and I am gratified to see the practical expression which has been given to that sympathy by the efforts put forth to relieve it. We, as a company, are more immediately connected with the trade in connexion with which this accident has occurred; all our profits are derived from the products of coal, and therefore it becomes our duty, as I think, to do something for these poor distressed creatures. I certainly regret the remark of the Lord Mayor, to which reference has been made, as to limiting the amount of the subscriptions in their aid; that, however, will not prevent you from doing what you will feel to be a duty in the matter. I have, therefore, the greatest satisfaction in proposing the following motion—"That this meeting, deeply sympathizing with the families who have been so mournfully bereaved by the recent accident at the New Hartley Colliery, hereby authorize the

directors, out of the funds of the company, to contribute the sum of one hundred guineas towards the fund now being raised for their support." (Cheers.)

Mr. LYNN: I second the motion.

After a few remarks, in the course of which Mr. BOX suggested that the amount should be £150, but ultimately withdrew his proposition, and the chairman having read Her Majesty's letter of sympathy and condolence with the bereaved sufferers at New Hartley, the motion was put and carried unanimously.

Mr. MAUGHAN: I beg leave to move—"That the thanks of this meeting be given to the directors for their careful management of the affairs of the company during the last half year." In the half year now before them, a great deal of vigilance will be required to defeat the attempts so cruelly made by certain individuals in the City to injure the property of the gas companies. It is a most unaccountable thing that persons with any right feeling should be so intent upon doing mischief to others as those persons appear to be. If they did but take into account the small profits which gas companies have had upon the average since their institution, I am sure they would not begrudge us the return which we claim the right to. I suppose it might be taken as a fact that, if the dividends of all the companies in London were concentrated, they would not have averaged 5 per cent. upon the capital embarked in these undertakings.

The CHAIRMAN: Nothing like it.

Mr. MAUGHAN: Those gentlemen would think it very hard if, in their private, professional, or commercial enterprises, they were condemned to receive a remuneration so limited. One would almost be inclined to wish it could be so, as a piece of just retribution; and, I am sure, no one would regret it after the wicked attempts made to injure the property of gas companies. No doubt, our directors will do all in their power to protect our interests in the future as they have done in the past; and, therefore, I have very great pleasure in moving a vote of thanks to them for their services.

Mr. HARDWICK seconded the motion, which was cordially agreed to.

The CHAIRMAN: Gentlemen, I can assure you we are much gratified at this expression of your approval. I need not say that we shall continue, I hope, to deserve your confidence, and, at our next meeting, I trust we shall be able to give you a better account. My worthy friend, who proposed the resolution, alluded to the way in which the gas companies have been dealt with in this metropolis. I think we have been most shamefully treated; for, while those who have agitated the question of the supply of gas in the City are anxious to have all that the Act of Parliament gives them, in regard to illuminating power, they are not willing that we should have the price which the Legislature says we are entitled to. There is one of these individuals I know who is engaged in the manufacture of candles, and who therefore cannot be supposed to look with any favour upon the progress of gas-lighting. But this gentleman meets other persons engaged in the same trade as himself, once a month, for the purpose of fixing the price at which they shall sell their candles. (Laughter.) They do not call that a monopoly, but open trading. (Hear, hear.) I beg to thank you, gentlemen, for the compliment you have paid us.

Sir CHARLES PRICE proposed a vote of thanks to the auditors.

Mr. GARRAWAY: I have great pleasure in seconding the motion, more especially as one of the gentlemen to whom it relates is a personal friend of my own. I would take the opportunity of stating that, from what has been remarked to-day, I think the amount of our unaccounted-for gas is rather excessive, considering that the area over which our pipes extend is so limited. If you could by possibility reduce it to 17½ per cent., I have no doubt you would be able to give us an 8 per cent. dividend next time.

The CHAIRMAN: I am much obliged by the honourable proprietor calling attention to the subject. I admit that the question is one of paramount importance, and that it deserves, as I assure you it receives, our very closest attention. But I should, perhaps, tell you that many of our mains are not of so large a capacity as they ought to be, so that we require a greater pressure than would otherwise be the case. Whenever we have the opportunity, we endeavour to replace these small mains with others of larger dimensions, and, I have no doubt, that when we meet you again, you will find that our leakage has considerably diminished, inasmuch as the pressure is being very much reduced.

The motion was put and carried, and Mr. HADLAND acknowledged the vote.

Mr. PERRY: I think we should not separate without offering an expression of our thanks to our worthy secretary, Mr. Millar, for the zeal and energy with which he has fulfilled the duties of his office. (Hear, hear.)

The CHAIRMAN: I fully concur in the remark of the honourable proprietor, and adopt most cheerfully his suggestion by moving—"That the thanks of the proprietors be given to the secretary, for the ability and energy with which he has discharged his duties."

Mr. MAUGHAN seconded the motion, which was very cordially adopted.

The SECRETARY: Gentlemen, this expression of your kind feeling towards me is exceedingly gratifying, and I accept it as a recognition of my honest and earnest endeavours to serve the interests of the company.

A vote of thanks to the chairman, on the motion of Mr. PERRY, seconded by Mr. BOX, was also unanimously adopted, and the chairman having briefly acknowledged the same, the proceedings terminated.

The workmen of the above company have raised among themselves the sum of £11. 11s. towards the Hartley Colliery Relief Fund.

METROPOLITAN BOARD OF WORKS.

FRIDAY, FEB. 7.

THE ROAD ACROSS HYDE PARK.

At the Weekly Meeting of the Board, held this day—Mr. THWAITES in the chair—a long discussion took place relative to the proposed formation of a roadway across Hyde Park.

A letter from the Hon. W. Cowper, First Commissioner of Works, was read, in which the line and character of the road approved by the Government was indicated. A letter from Mr. Train was also read, asking permission to lay down a tramway along the proposed road, and offering to pay to the board a toll of one farthing per passenger conveyed thereon in his cars; the yearly total of which tolls, he estimated, would pay the board 6 per cent. upon the capital invested in making the road. Communications were read from the Strand and Greenwich District Boards, expressing disapproval of the expenditure of the rates for carrying out the projected improvement.

Mr. ECKETT moved a resolution to the effect that, as there are many public improvements in the metropolis of greater importance to be undertaken than that of making a new road across the property of the Crown in Hyde Park, and which the board are unable to effect for want of suitable means for the purpose, it was not expedient to make the proposed road.

Mr. BROOKER seconded the motion.

Mr. ROCHE, in a speech of considerable length, moved, that the First Commissioner's letter be referred to the Streets Committee. Having alluded to the absolute necessity for improving the means of communication between the north-western and south-western parts of the metropolis, especially having regard to the approaching Exhibition, he proceeded to show that the road now proposed, and which would effect so desirable an object, could be made without imposing upon the ratepayers any undue burthen. That the road would in any case be made, he believed, there was no doubt; the only question seemed to be, whether this board would show itself equal to the work assigned it by the Legislature, and undertake it as a metropolitan improvement, or whether the requisite funds should be raised by bonds or debentures, and a toll imposed upon all who used it?

Mr. LE BRETON seconded the amendment, believing that the board would lose credit with the public if they refused to entertain the question. The approaching Exhibition had served to bring out more clearly the necessity for the improvement; but, in any case it must, from the rapidly increasing traffic between the two districts, have been undertaken.

Mr. BENNETT opposed the amendment, because it was proposed by the Government to throw the whole burthen of the road upon the ratepayers. As any contribution from the Consolidated Fund for metropolitan improvements was always refused, the metropolis ought to be left in possession of its own resources, and therefore when the present amendment was disposed of, he should move a resolution to the effect, that the board would take measures forthwith to carry out the work, provided Mr. Cowper would obtain the sanction of Parliament for transferring to the board, for the purpose of effecting public improvements within the metropolis, the income arising from hackney cabs and omnibuses collected within the metropolitan area.

Deputy HARRISON hoped the reference to the committee would be sanctioned, as he was almost confident they would be able to suggest means for effecting the improvement out of surplus funds coming into the hands of the board.

Mr. BRISTOW, M.P., admitted that this road would be an improvement, but, denied that it was urgently required. The First Commissioner might, during the Exhibition, allow carriages to pass through Hyde Park, under the regulations of the police, and then, *cadet quæstio*, the difficulty was solved.

Messrs. DOULTON, FREEMAN, SAMUDA, DIXON, NICHOLAY, and PECKET, supported the amendment, and Messrs. PHILLIPS, D'IFFANGER, ROBINSON, and DERMER, the original motion.

The amendment on a division was carried by 22 to 17, and a subsequent amendment embodying Mr. Bennett's suggestion was negatived by 25 to 14.

It was then resolved that the committee meet on the following Monday, and that a communication be addressed to the First Commissioner, informing him of the course adopted by the board, and asking for the plan, and estimates of the proposed road.

THE SALE OF GAS ACT.

Mr. DALTON brought up a report from the committee of the whole board under the Sale of Gas Act, recommending that the salary of Mr. Cresy, principal assistant-clerk, be increased from £350 to £500 per annum, and that the resolution of the board of the 22nd of February, 1856, be so far varied as to admit of such increase. He stated that the committee were unanimous in their appreciation of Mr. Cresy's services, the only question on which there was a difference of opinion being as to the principle upon which the increase of his salary should take place.

Mr. DOULTON seconded the recommendation of the committee.

Mr. BIDGOOD moved, and Mr. SAVAGE seconded, an amendment to the effect that a gratuity of £100 be presented to Mr. Cresy, in consideration of his extra services in carrying out the provisions of the Sale of Gas Act; that his salary be raised from £350 to £400 for the current year, and that it be subject to a further addition of £25 a year, until it shall attain a maximum of £500 per annum.

The amendment gave rise to considerable discussion, owing mainly to the fact that the proposed gratuity of £100 was not within the terms of the notice of motion. The chairman, however, ruled that it was in order, and ultimately it was carried by a majority of 23 to 11.

ON SOME RECENTLY-EXECUTED DEEP WELLS AND BORINGS.

By GEORGE R. BURNELL, Esq., C.E., F.G.S., F.S.A.

[Read before the Society of Arts, Jan. 28, 1862.]

The remarkable success of the operations carried on at Passy, for the supply of the artificial waters of the Bois de Boulogne, by means of an artesian boring of unusually large diameter, has lately revived the public interest in that class of operations, both on the continent and in England. It has been proposed, indeed, to apply that system, on even a larger scale than was tried at Paris, to our own metropolis; and the scheme for sinking a series of deep wells in the various parts of London has been revived by some enthusiastic admirers of the results arrived at by our neighbours. Experience has already decided the problem of the possible success of such attempts here; and it may, therefore, be desirable, at the present day, to review briefly the history of artesian wells at home and abroad, in order to prevent the waste of money and the disappointment which may arise from ill-advised imitation of the measures proved to be successful in some cases, but by no means universally applicable.

The term, "artesian well," means, strictly speaking, only a well sunk to a considerable depth, through a dry and impermeable upper stratum, to a lower stratum charged with water, under such conditions of pressure as to cause the water to flow over the surface of the ground. The first wells of this description mentioned in modern works on hydraulics were executed in the province of the Artois, in France, where they were sunk in the chalk formation, and were supplied by the streams running between the fissures of that deposit, which were fed by the infiltration from the higher ground of the great north-eastern chalk plateau of France. It is said, that some of these wells in the Artois have been used for nearly a thousand years, without any perceptible diminution in their supply; but it must also be added, that the ancient Egyptians and the Chinese had, from the remotest antiquity, been acquainted with this method of obtaining water, and that the inhabitants of the plains of Lombardy have long used the waters rising from the deep-seated strata of the valley of the Po for the irrigation of their "marcite," or winter meadows. Be this as it may—and without dwelling upon the locality where this description of well was first made—it seems that, about the beginning of the present century, great attention was drawn to them by the success of a number of borings, through the London clay, into the sands of the basement-beds of that formation, made in the valley of the Lea, near Broxbourne, Waltham, and Tottenham; and of the Wandle, near Mitcham, Garratt, Wandsworth, &c. In the low-lying alluvial islands at the mouth of the Thames, some very deep wells were also sunk through the London clay, and a copious supply of fresh soft water was

obtained; and, in fact, so many wells have been sunk into the water-bearing strata of the tertiary sands, that they have been nearly exhausted. Whilst these operations were being carried on in England, the French engineers had energetically adopted the system upon which they were founded, and numerous artesian wells had been sunk at Epinay, Stans, and St. Denis, with similar results to those obtained near and in London, that is to say, that in the earlier wells the water, generally speaking, overflowed the surface, whilst in the later ones it rarely attained the level of the ground; and the water-line sank in the older wells in proportion as new ones were opened.

In 1833, M. Arago induced the *Conseil Municipal*, of Paris, to undertake the execution of a deep boring, in the hopes of obtaining a supply of water from the lower green-sand formations, which, he supposed, to form a continuous bed under the chalk basin, underlying, in its turn, the tertiary strata of the neighbourhood of Paris. This lower green sand, in fact, outcrops from under the chalk on the whole of an irregular oval, passing from the north-east through the south, nearly to the north-west of Paris, and it approaches that city the most nearly at the point where the Seine forces its way through the overlying recent formations near Troyes, in Champagne. At Lusigny, the precise point of outcrop, the surface of the green sand is about 300 or 350 feet above the level of the plain of Grenelle, where it had been resolved to make the first attempt to traverse the tertiaries and the chalk. From this fact, MM. Arago and Walferdin inferred that the water from the green sand would flow over the surface at Grenelle, and they were encouraged in that opinion by the existence of numerous artesian wells carried through the chalk, into that stratum from which they expected to obtain their supply at Elbœuf and Rouen. The depth, it would be necessary to sink the new well, constituted the unknown conditions of their undertaking; but, not only MM. Arago and Walferdin, but, also, M. Mulot, calculated from the first, that they would find the chalk extend to at least 1300 or 1400 feet from the surface. So little, however, was known of the probable cost, or of the dangers and risks of these deep borings, at the time the well of Grenelle was commenced, that the municipality of Paris only voted a sum of 18,000 francs (£720) for boring three such wells.

On the 29th of November, 1833, the works of the Grenelle well were commenced by M. Mulot, and, after encountering many serious difficulties from the nature of the ground, and from the fracture of the tools made to work at so great a distance from the surface, the able and scientific men who had supported M. Mulot through evil report and bad report, were rewarded by finally obtaining a copious jet of water from the lower green sand, on the 26th of February, 1841. The depth then reached was 1806 feet 9 inches, of which 1378 feet were in the chalk; the water rose at first at the rate of 800,000 gallons per day, to the height of about 122 feet (the level of the distributing reservoir of Grenelle), and its temperature was about 82° Fahr. When it first rose to the surface, it contained large quantities of sand, clay, and other matters in mechanical suspension, and it was nearly twelve months before the water passages of the subterranean strata were sufficiently cleared to allow the water to rise in a state fit for distribution. On several subsequent occasions also, the sand has accumulated in such quantities, in the pipes lining the bore, as to render it necessary to draw and clean them.

This boring operation had been watched very carefully by English engineers, and, even during its progress, similar works had been attempted in our own country. As might naturally have been expected, the success of the Grenelle well, under these circumstances, induced our countrymen to continue their work with redoubled ardour; but, unfortunately, they have displayed less perseverance, and, it is to be feared, less skill than our neighbours; for hitherto none of the deep borings undertaken avowedly for the purpose of obtaining a supply of water from the subcretaceous beds in either the London or the Hampshire basins, have completely succeeded. In the case of the Kentish Town well, it is true that some very extraordinary and anomalous conditions of the strata have been found to exist, which have totally deranged all the scientific calculations of the able geologists and well-borers consulted during its execution; but it has too often happened in England, that works of the kind we are now considering, have been undertaken solely on the recommendation of amateur geologists, or of "practical men," as it is the fashion to call those who are totally ignorant of recorded science; and the consequence has been that several very costly wells have been undertaken, carried on at great expense, and subsequently abandoned in despair, perhaps just at the moment when success was within grasp.

One of the earliest of the attempts made in England at sinking an artesian well to the lower green sand, was the one made, almost unintentionally, by the town of Southampton. It was commenced by a preliminary boring through the London clay to the chalk, which was reached at the depth of 480 feet from the surface; the upper strata traversed consisting of the sands, clays, and plastic mottled clays of the Hampshire tertiary series. It seems that the well-borer employed carried the boring to a depth of 50 feet beyond the surface of the chalk already mentioned, and he then reported that an ample supply of water was to be obtained from that formation. A shaft was sunk, on faith of this report, commencing with a cast-iron lining of 13 feet diameter, which it was proposed to carry to a depth of 160 feet, and then to commence boring with a hole of 30 inches diameter diminishing gradually to 20 inches in the chalk. The cylinders used were, however, found to be too weak for the purpose they were intended to fulfil; they collapsed in places, and, in driving, they assumed a direction seriously out of the perpendicular. The contractor failed when the cylinders had been thus badly lowered to the depth of about 60 feet, and the works were then taken out of his hands, and placed in those of Mr. Docwra, one of the most able well-sinkers and water-works contractors of our country and of our day. With great trouble, he drove the shaft completely down to the chalk, finishing it with a clear external diameter of 9 feet 4 inches; part of it was lined with cast-iron plates, and part of it with brickwork in cement. The brick-work lining was carried 3 feet into the chalk, and below it the shaft was continued to the total depth of 562½ feet from the surface, in the solid chalk, without any lining, and with a clear diameter of about 7 feet; a boring was then commenced of 7½ inches diameter, and was carried down eventually to a total depth of 1317 feet from the surface. The chalk formation was found here to have a thickness of 851 feet, and the works were suspended when the boring had traversed only 12 feet of the chalk-marl. Now, at Chichester, where Mr. Gatehouse had also sunk a deep well, to the upper green sand, about the same period, the thickness of the chalk-marl was found to be 61 feet; the upper green sand and gault are of variable thicknesses, but the greatest depth recorded for them was that of the new well at Passy, where they were about 274 feet deep. It is, therefore, very probable that, if the Southampton well had been carried down 330 feet further, or to a total depth of 1650 feet in round numbers, the problem as to the possibility of finding water from the lower green sand, in the Hampshire basin, might have been solved. In the well at Chichester, this solution could be even more easily attained, for the boring had actually been carried about 130 feet nearer to the probable surface of the lower green sand, leaving only 200 feet still to be traversed.

It would be impossible to record all the important works undertaken, of late years, for obtaining water by means of artesian wells; but the circumstances connected with the history of those attempted at Calais, Kentish Town, and Harwich, are so singular, that it behoves us to dwell upon them. At Calais, the well was sunk through the chalk, and the whole series of the subcretaceous strata, to a total depth of 1047 feet from the surface, but no water was obtained from it, and the boring passed, at the depth above-named, into the transition rocks, in which it was carried for a further depth of 103 feet. At Kentish Town, the Hampstead Water-Works Company endeavoured to secure an artesian supply, in order to comply with the provisions of the Metropolis Water Works Act of 1851. They had very wisely consulted Mr. Prestwich upon the geological questions involved in the preliminary inquiries, and they employed Messrs. Degoussé and Laurent, the best known and the most successful well-borers up to that period, on the continent. Geologists and practical men alike in this instance reasoned that, because the lower green sand outcropped around the edges of the chalk basin containing the London tertiaries, in precisely the same manner that the lower green sand outcropped around the chalk basin containing the Paris tertiaries, therefore, there was every *à priori* reason to believe that the subcretaceous formations would continue under London, and furnish, as had been the case at Paris, the water for a well carried down to them. Acting upon this belief, the company commenced boring in the chalk, at the bottom of a shaft previously sunk to the depth of 339 feet from the surface. The boring was commenced with a diameter of 12 inches, reduced to 10 inches in the intermediate part, and finishing with a diameter of 8 inches. The work began on the 10th of June, 1853, and was carried on with every appearance of success for a considerable time. The strata traversed were found to occur in their regular order, and of the anticipated thicknesses, until the boring had traversed the gault formation at the depth of 1113 feet 6 inches from the surface; but when, as Mr. Prestwich said, everybody believed that "a very few more turns of the auger would tap the water-bearing sands of the lower green sand formation," it was found that the borings passed at once into a series of beds consisting of alternate layers of red sandstones, red clays, conglomerates, red sands, and rounded pebbles, which geologists are now disposed to class amongst the new red sandstone series. It is very difficult to form any decided opinion as to the real nature of a deposit which has only been explored by the boring tool, especially when the diameter of the bore was only 8 inches, as at Kentish Town, and I confess that for my own part, as I said before in this room, and shall have occasion again to repeat, I am disposed to regard the beds of red clays and sandstones rather as being members of the Wealden series than of the new red sandstone. But, in either case, it was evident that the water-bearing strata were interrupted under London, and that there was no probability of obtaining a supply of any description from them in that district. In fact, the Hampstead Water-Works Company, after the failure of this attempt, were compelled to sell their interests to the New River Company, and the well was stopped at the depth above quoted, added to the depth traversed in red sandstones and clays, or at a total depth from the surface of 1302 feet.

About the same time that this unexpected result was obtained at Kentish Town, Mr. P. Bruff, C.E., was employed upon an attempt to obtain water for the town of Harwich, either by a deep well in the chalk, or by traversing, if necessary, the strata below the chalk. Several attempts appear to have been previously made at Harwich to obtain a supply from the chalk, but they had failed, in consequence of the infiltration of salt water into the wells sunk close to the seashore. Mr. Lankaster Webb, of Stowmarket, a town situated upon the high lands of the valley of the Gipping, the main affluent of the Orwell, had executed a well 895 feet deep, through the drift clays and gravels over the chalk, the cretaceous formations, and the upper green sands and gault. I do not know the level of the ground at Mr. Webb's factory, but, as a rough guess, I should say that it was about 240 feet above the high-tide level at Harwich; and I am not, therefore, surprised that the persons connected with the well at the latter town should have expected that, upon traversing the chalk, they would meet with a supply of water under the true artesian conditions. It happened, however, that, after the Harwich boring had passed through the drift, the tertiary strata, the chalk, the upper green sand, and the gault, to the depth of 1025½ feet from the surface, it passed, not into the lower green sand, but into a black slaty rock, which Mr. Prestwich pronounced to be a common grey slate of the palæozoic series, whose precise position, in the series could, however, hardly be defined, on account of the absence of fossils. Thus, at Calais, and I believe also at Ostend, the lower green sand is wanting, and is replaced by a member of the carboniferous series; at Kentish Town, the lower green sand is absent, and it is replaced, perhaps, by the new red-sandstone beds, whilst at Harwich the lower green sand is replaced by the very earliest clay slate rocks.

Now, there may be drawn, from these unexpected results of the deep borings in the tertiaries, of what may be specially named the London basin, some valuable scientific and practical conclusions. These may be briefly stated as follows:—1st. That at present, geology is only so far advanced as to enable us to state, with tolerable certainty, what we shall *not* find under the surface, but by no means to justify any positive assertion as to what we *shall* find: thus, knowing that the London clay is on the surface, we may be certain that the crag will not be found beneath it, but it by no means follows that necessarily the chalk, the lower green sands, the oolites, or the usually subordinate strata, should be there. 2nd. That the first attempt to sink an artesian well through a previously untried stratum, is, at all times, a hazardous experiment, and that it is, therefore, one which should never be tried by those who only work with the money raised by forced taxation. It was upon the latter ground that Mr. Ranger very properly recommended the town of Southampton to stop the philosophical experiment, upon which they had already incurred so large an outlay; and it is certainly wiser to leave the solution of these problems to municipalities possessed of private resources, or to private enterprise, than to expend upon them the money wrung from the ratepayers. 3rd. And possibly this may be the most important conclusion of all—it would appear to be proved by the occurrence of the earlier strata in the geological series at Calais, Kentish Town, Harwich, and, if I be not mistaken, at Ostend also, that Mr. Godwin Austin's theory of an upheaval of the carboniferous series existing between its extremity on the French coast, and its reappearance in the Bristol and the South Wales coal-field, is correct. A full discussion of this important inquiry would be misplaced in this paper, but I cannot refrain from repeating what I myself have said before—viz., that from all which is at present known, it would be more rational to seek for coal under London than for soft water. At the same time, I would carefully guard myself

against any appearance of encouraging an attempt of the former description, unless it were distinctly undertaken as a speculation, with great, nay, almost infallible chances of loss.

The next important artesian borings executed of late years in chronological order, were those undertaken under the superintendence of the French military authorities in the Desert of Sahara, avowedly for the purpose of forming stations for the caravans trading between Algeria and Central Africa. They were executed by means of tools made by Messrs. Degoussé and Laurent, who seem also to have occasionally acted as consulting engineers, but the works were actually performed by the soldiers, or the labourers employed by the "Corps du Génie Militaire." It appears that up to the month of June, 1860, no less than fifty of these wells had been sunk in the desert, and that they pour upon its thirsty surface no less than 7,920,000 gallons of water per day. Similar works were, according to Aimé Bey, executed in the deserts of Ancient Egypt, as was before alluded to, and there are good reasons for believing that the system of artesian borings might advantageously be applied in the deserts of north-western India, and of Australia.

Some interesting artesian wells and borings have also been executed in various parts of England and of the continent, to a few of which I propose to return hereafter; but, in the meantime, I pass to the description of the great work lately completed at Passy, as being the one which has attracted the most universal attention. When the great works of the Bois de Boulogne were commenced, it was soon discovered that the pumps of Chaillot would not be able to furnish the quantity of water required for the lakes and waterfalls of the new park; and the Municipal Council of Paris—encouraged, no doubt, by the commercial results of the previous operation at Grenelle (which had eventually cost the sum of £14,000, and had repaid its cost several times over)—resolved to execute a second boring to the lower green sand, in order to secure an independent supply. It was originally proposed to execute this well of the same dimensions as that at Grenelle—that is to say, to finish with an 8-inch bore—but, before it was commenced, M. Kind, a German engineer (who had already carried out some very important works, upon a system and by the aid of tools patented by himself), offered to contract for the new well to finish with a bore of 2 feet in diameter, and to deliver the water at 92 feet above the level of the ground, at the rate of nearly 3 million gallons per day. He undertook to complete the work, for the sum of £14,000, within the space of two years. After some opposition, based principally on the doubts expressed by engineers, who had been consulted on the subject, with respect to the increased delivery over that of the well of Grenelle, this offer of M. Kind's was accepted; and, on the 23rd of December, 1854, the vote of the Municipal Council in favour of the contract with him was passed. The work was commenced shortly afterwards, and, by the 31st of May, 1857, the boring had already reached the depth of 1732 feet from the surface: when suddenly, the upper portion of the tube-lining collapsed, at a distance of about 100 feet from the surface, and choked up the bore-hole. This accident delayed the completion of the work for three years, and led to the rescinding of the contract with M. Kind; but the engineers of the city of Paris were so satisfied with his zeal and ability, that they confided to him the conduct of the remaining works. A new well was sunk to a depth of 175 feet 4 inches, and the boring was then cleaned out and resumed. Much trouble was encountered in traversing the strata below the distance of 1732 feet above quoted, and at length, at the distance of about 1894 feet from the surface, the first water-bearing stratum was met with, but the water, after several oscillations, did not rise to the level of the ground. The boring was continued below this level, until, on the 24th of September, 1861, at midday, at the depth of 1923 feet 8 inches, the true artesian spring was tapped. When this spring rose to the surface, it discharged at the rate of 5,582,000 gallons per day. The yield has since then oscillated, but so long as the column had not been raised above the level of the ground, the total quantity does not seem to have fallen short of 4,465,600 gallons. The well of Grenelle (which, by the way, had been falling off in its yield for some time before the completion of the Passy boring, no doubt, on account of some obstruction in its ascensional tube, but which, for several days before the 24th of September, discharged regularly 200,000 gallons per day) fell, in about thirty hours after the Passy spring had been tapped, to a yield of about 173,000 gallons, at which rate it remained stationary, until the tube of the Passy boring was raised, so as to allow the water to stand at the same height in the two wells, when the original rate of delivery of the Grenelle well was resumed, but the rate of delivery of the Passy well fell to two million gallons per day. It is intended, eventually, to cause the column of water of Passy to rise to a height of 1977 feet above the bottom of the boring, or about 54 feet above the surface of the ground. The horizontal distance of the Passy well from the one at Grenelle is about 3830 yards; and it will be observed, from the section on the wall, that the water-bearing stratum is nearly 100 feet nearer the mean level of the sea at Grenelle than it is at Passy, whilst the surface of the ground is about 35 feet higher at the latter locality, than it is at the former one.

Unquestionably, the effect produced upon the respective sources of supply, by the alteration in the heights of the columns of water, proves that the wells of Passy and of Grenelle are fed from the same stratum; and there can be no reason, therefore, to suppose that, when the Passy spring shall have cleared its water passages, there should be any difference in the qualities of the waters at the two places. M. Peligot has carefully analyzed the Grenelle waters, and he found that they contained 0·000142 of saline matters, composed principally of the carbonates of lime, potash, and magnesia, associated with a compound of sulphur, and of soda of variable proportions and conditions, and with the carbonate of the protoxide of iron and silica. The salts of the sulphate of lime, or of the more permanently insoluble description are absent, and it would appear that the gases diffused through the water are of considerable volume, the carbonic acid being one of the most so. There is a sensible evolution of sulphuretted hydrogen from both the wells of Passy and of Grenelle, and it is worthy of remark that the same gas is given off from the water in Mr. Gatehouse's well at Chichester, though, in the latter instance, the smell is sufficiently strong to render the water positively repulsive. At the present day, the water at Passy is still foul, on account of the matter it brings up in suspension; but, as in the case of the Grenelle well, this inconvenience will no doubt soon disappear. The temperature at which it reaches the surface is identical in the two wells, and is about 82° Fahr.

It may be worth while to call attention to the mechanical means adopted by M. Kind in sinking a boring, of the large diameter of 2 feet 4 inches, to the enormous depth of nearly 2000 feet from the surface. The work was commenced by a shaft, as usually is the case, and, after it had been sunk to a depth of about 50 feet, the boring commenced, and was continued with as nearly as possible the same diameter to the bottom. M. Kind employed for this purpose what may be called rods with releasing-joints, very closely resembling the joints introduced by Œuyenhausen, which allowed the cutting portion of the tool to be raised a certain height, and then to be released automatically; this arrangement was adopted in order to avoid the lashing of the sides of the bore by the long rods, and to regulate the force of the blow. The cutting tool used by M. Kind also differed from the tools generally employed, for it consisted of a single or a double trepan, according to the nature of the ground, instead of the ordinary chisels and augers. A patent was taken out for these tools by M. Kind, No. 13,478, of the year 1854, the printed specification of which contains a series of engravings of the various modifications proposed for the various kinds of rocks; in the *Annuaire Scientifique* for 1861, illustrations will also be found of the ordinary trepans, and of the slide-joints. M. Kind is able, by these combinations, to strike as many as twenty blows in a minute, with the greatest regularity, at a depth of 2000 feet. The patent of 1854 specifies also certain methods of lining the sides of the borings; but it must be confessed that they do not seem to me to possess any great merit, and, indeed, M. Kind had more difficulties to encounter at Passy from the collapsing of his tubes, than from any other cause. It is a common error of well-borers to undervalue the effort exerted by clays swelling when charged with water; and the great delays encountered in sinking the Passy well were precisely caused by the false economy introduced in the execution of the tube-linings. The time actually employed in sinking the Passy well was nearly the same as that employed at Grenelle; in the former instance, it was 6 years 275 days; in the latter, it was 7 years 90 days. The cost of the Grenelle well, as above stated, was £14,000; that of the well at Passy was £40,000, but it must be observed that the quantity of water, delivered at the same height in the two cases, is ten times greater at Passy than it is at Grenelle; the rates of delivery are, in fact, nearly in the direct ratios of the diameters.

I have not been able to learn whether the artesian wells of Elbœuf and of Rouen have been affected by the completion of the new well at Passy; and, at present, I am inclined to believe that they may escape this action, on account of their proximity to the entering-ground of the lower green sands, on the western margin of the cretaceous basin. At Tours, however, so many wells have lately been sunk (in an early edition of M. Degoussé's excellent *Guide du Sondeur*, that gentleman mentions that he himself had executed no less than sixteen of them), that the subterranean supply is becoming exhausted; and, as in the case of the wells supplied by the basement beds of the London clay, the lower green sand wells are gradually losing their artesian character. In two wells, also, at Evres and Ferrières, the subcretaceous formations yielded no water; and, in the latter, the bore was even carried to a depth of 30 feet in the great oolitic, or jura limestone series, without obtaining a supply. I call especial attention to this fact, because it illustrates again the uncertainty at all times overshadowing the execution of the first deep wells in a particular district, and that the stratum which yields water in one locality is likely to be unable to do so in another. The enterprising gentlemen who are engaged at the Hastings well should bear this fact in mind; and, though I believe that, after they shall have traversed the lower members of the Wealden series, they are more than likely to find the upper or Portland oolite, which is of sufficient water-bearing power to insure them a good supply of water: they must also be prepared for disappointment. The Hastings well is already 553 feet deep, still in the Hastings beds; and, as these have never yet been traversed, it is impossible to say whether they will be found to be seven or seventeen hundred feet thick. Most probably, the former guess will be found to be the more correct, because the town of Hastings is situated at a low horizon in the series of Weald beds; but all operations of this description at Hastings must, for the present, be conducted in doubt as to the ultimate result, however strong may be the hopes of success. The character of the strata already traversed, and of those likely to be met with at Hastings, leads me to believe that M. Kind's processes would be particularly applicable there; but the success of such an operation would still be a mere matter of speculation, such as ought to be left to private enterprise.

I dwell a little upon this point, because the board of guardians of Brighton are engaged upon a similar experiment, at a place called the Warren Farm, near that town. It is not my place to criticise the mode of execution adopted in carrying on this work; but I cannot refrain from saying that there are many things about it which seem to me to be in opposition to the opinions now entertained by scientific engineers; and I gravely suspect that, even if water from the subcretaceous formations should be obtained at this well, it cannot, by any possible chance, rise near the surface, which, at the Warren Farm, is not less than 410 feet above the mean tide-level. It is inexplicable to me, also, that this well should be continued by means of a shaft, at the great depth already reached, instead of by means of boring; and I regret bitterly to see an experiment, which has been carried on hitherto with so much spirit, compromised by what I consider the mistaken course latterly adopted. At Brighton, nevertheless, the only chance of securing a supply in the parts of the chalk basin lying beyond the influence of the faults, or "cross-throws," which have, for instance, enabled the Water-Works Company to obtain, as is said, one million gallons per day, is to penetrate the chalk to the lower green sand. Notwithstanding the cost of the previous experimental borings in the surrounding countries, I am convinced that the cheapest manner of effecting this object would have been to have bored, rather than to have sunk a shaft; and, even now, the guardians would do wisely to adopt this course, especially as theirs is really the first experimental shaft or boring on the east bank of the Arun. It is, however, a sad peculiarity of the municipal bodies of England, that they are always disposed to listen to those whom it is the fashion to call "practical," in contradistinction to "scientific" men; as though the mere fact of working "by rule of thumb" gave men truer insights into the laws of nature than long study and careful observation. At Brighton, this seems emphatically to have been the case; and, in a report addressed to, and received by, the board of guardians, the opinions of three practical well-borers are quoted, as to the probable cost of continuing the well at Warren Farm; but no opinion seems to have been asked from such men as Mr. Hawksley, Mr. Mylne, or Mr. Homersham, who have brought great experience and deep study to bear on the hydrographical conditions of this district on other occasions, It is one of the fashionable theories of the day, that a scientific education incapacitates a man for the exercise of a profession; and that the most able men in any branch of art or science are those who have not been brought up to pursue it. Under these circumstances, it may not be surprising, however unfortunate it may be, to find empiricism preferred to science, or that the Brighton guardians should avoid taking the opinions of really eminent engineers.

In stating, in the previous part of this paper, that I should return to the question of the abnormal beds met with at Highgate, I had especially before my mind's eye the cases of the well sunk under my own orders at Warnham Court, near Horsham; and at Red Hill, by my friend, Mr. Docwra. In the former case, the boring, after it had been carried through the sand-

stones, clays, and shales of the upper Wealden deposits, passed, at a depth of 142 feet from the surface, into a bed of red clay and sandstone intermixed. At first, I believed, from the external characters of the materials, they were of the same nature as the beds found at the bottom of the Kentish Town well; and I was supported in this opinion by several distinguished geologists to whom I showed the samples. As the Kentish Town beds were, at the time I refer to (about five years since), universally considered to be members of the new red sandstone series, of course, I regarded the Warnham bed as one of the same range. But Mr. Docwra, at Red Hill, after he had traversed the sands and loams of the subcretaceous series to a depth of 438 feet, passed into a bed composed of red clays and particles of red sandstone, which were identical with the Warnham beds, and with some members of the Wealden series. It seems, therefore, to me to be very probable that the Kentish Town beds may be members of the Wealden series, but the solution of this question has simply a geological interest, for alike, the Weald clays, and the new red sandstone clays, are without water; and, under these circumstances, the wisest course to be adopted was to stop the further progress of the works in all such cases as Warnham and Red Hill, unless they were carried on distinctly as philosophical experiments.

The well at Rugby, though it has proved to be, no doubt, a source of annoyance and disappointment, may eventually turn out to be of importance to the commercial interests of the locality. It was commenced with the hope of finding in the new red sandstone series, under the lias, some water-bearing strata which might be able to furnish a supply to compensate for the deficiency under which the town of Rugby was suffering, after it had been put to the expense of carrying out the absurd crotchet of the so-called "gathering-grounds" system. A boring has here been carried down to a great depth in the new red sandstones of the triassic group, which, at Liverpool and Birkenhead for instance, frequently supply large quantities of water. At Rugby, however, the boring at present has only yielded a brackish water, and I suspect that now all hopes of securing the result desired by the local board of health, by this well, must be abandoned, unless the board determine upon tubing the bore-hole throughout its length, and upon continuing to sink to a much greater depth. It is possible that, within a moderate distance from the bottom of the present well, stronger brine springs than those now brought to the surface may be found, which it would be possible to evaporate economically, for the purpose of salt-making; but, a very careful comparison between the strata of this locality and of those near Derby or Droitwich, would be required, before any decided opinions could be formed as to the probability of finding soft water within a reasonable distance from the surface at Rugby.

The well at Great Yarmouth, executed by Sir E. Lacon and Co., is of interest on account of its showing the great depth attained by the tertiary strata on the east of England; but, unfortunately for the spirited proprietors, the results, so far as water supply is concerned, have been "negative." The depth of the tertiaries here was found to be 527 feet, and the first 170 feet of this thickness were composed of recent estuarine and blown sand, deposits of very recent formation. At Norwich, Messrs. Colman are steadily pursuing an experimental boring, which has already passed through the chalk to a depth of 1158 feet, the upper green sand to a depth of 8 feet, and the gault to a depth of 30 feet; the works have been suspended in this formation on account of some accident to the machinery, but, when this shall have been repaired, they will, no doubt, be resumed. It may be necessary to descend 150 feet lower before reaching the water-bearing stratum, but the comparative success of Mr. Lankester Webb's well, at Stowmarket, affords good reason to hope that Messrs. Colman's perseverance will ultimately be rewarded. I do not anticipate, however, that the water will overflow the surface, because the lower green sand is traversed by one of the affluents of the Ouse, near Downham Market, at a comparatively low level.

In a paper, which I had the honour of reading in this room last year,* I alluded to the very successful borings made by the Kent Water Works Company, in the Ravensbourne Valley, and, this evening I am enabled to lay before you a section, showing the strata they traversed. One reason for my doing so is, because I have heard that some parties propose, as I said in the opening paragraph of this paper, to sink artesian wells near London for the supply of the metropolis; and, I think it desirable to state, for their guidance, that, unless they meet with the peculiar conditions of the faults of the Ravensbourne valley, they are not likely to obtain a large supply of water from the chalk on the north side of the Thames, whilst there is no chance whatever of their finding water below the chalk. There are, no doubt, copious and beautiful springs given off from the head valley of the Lea and the Coln, both of which rise in, and are fed by, the chalk; but those springs may, in almost all cases, be shown to be connected with some geological disturbance of the strata; and the only locality near London where there seems to me to be any chance of obtaining a large quantity of water from the chalk, would be on the left bank (or the west) of the river Lea, somewhat to the north-east of Stratford, because there is about that district a line of disturbance in the chalk parallel to the great fault which brings to the surface the springs lately tapped near New Cross, and those of Grays, in Essex.

Finally, it must be evident to any one who reads attentively the records of the success and of the failure of the attempts above mentioned, that the execution of artesian wells is an operation which should only be intrusted to skilful and well-tried men, acquainted with the theory and practice of their art. No such work should be commenced without a careful preliminary survey of the geological and hydrographical conditions of the country extending over a very wide range. This is seldom done, because public bodies, in England at least, do not seem to object to pay for engineers blunders and miscalculations, but they do object to pay for their study; and it is at once assumed that, because artesian wells have succeeded in one case, they must succeed in all. But, even when the greatest amount of skill and science have been brought to bear on the preliminary investigations for the establishment of an artesian well, it is impossible to predict with any certainty what the result of sinking a shaft or a boring may be in a stratum hitherto untried. Moreover, every artesian source of supply is limited in amount; and, even in the case of the Paris basin, it would be desirable to watch the effects of the increased draught upon the lower green sand during a dry summer, especially before commencing, as has been proposed, the execution of a large number of wells like those of Passy and of Grenelle.

The student who may desire to obtain a complete view of the subject thus briefly referred to, would do well to consult the works of Messrs. Prestwich, Mylne, Clutterbuck, Homersham, Degoussé, Burat, Hericart de Thury, Garnier, &c., the Transactions of the Institution of Civil Engineers, the *Comptes Rendus* of the *Académie des Sciences*, and of *Les Ingénieurs Civils* of France. I am myself under great obligations to Messrs. Hawksley, Lockwood, Wells, Chamberlain, Docwra, Prestwich, Morris, Snider, and others, for the sections and information so liberally supplied to me.

I may here add that in the number of *La Presse Scientifique*, for the 16th of January, of this year, I find a notice of a well lately sunk at Columbus, Ohio, U.S., which is not less than 2575 feet deep. The thermometer (on the system invented by Mr. Walferdin) registered a temperature of 88°; this would seem to show that the law of the increase of temperature is rather slower in Ohio than it is near Paris. No particulars are, however, given of this important boring.

* See page 90, Vol. X.

MEETING OF LONDON GAS WORKMEN.

Last night, a crowded meeting of indoor and outdoor workmen of the London gas companies, lamplighters and others, was held in St. Luke's School, Northampton Street, King's Cross, to listen to addresses on religious subjects—R. BAXTER, Esq., presiding.

The proceedings commenced by a devotional service, conducted by the Reverend Mr. Andrews, incumbent of St. Luke's district.

The CHAIRMAN addressed the meeting, and called attention to the great religious movement of the present day, and especially to the efforts now being made by the clergy and laity to promote the moral and spiritual welfare of the working classes. Mr. Catlin, who had taken great interest in the subject, on behalf of the men employed in the metropolitan gas companies, having spoken to him respecting it, he had placed himself in communication with the various boards of directors, asking that accommodation might be provided in the works for the holding of religious services. He was gratified in being able to state that from two of the companies—the Chartered and London—he had received answers stating that the directors would gladly appropriate a room for the purpose once or twice a week, as might be required. He concluded by urging upon the men the importance of attention to religious matters.

The Rev. Mr. ANDREWS spoke of the arrangements which had been made in that neighbourhood, specially for the instruction and moral training of the men engaged in the Imperial Gas Works, and assured those of them who were present, that he should be at all times happy to render them all the aid in his power, and to visit them when laid aside by sickness or involved in difficulties or distress.

Mr. J. F. ELWIN followed, and dwelt at length on the religious awakening in the metropolis, and the steps which had recently been taken, by means of special services in theatres and other places of public resort, to bring truths of the highest moment to bear upon large masses of the working classes.

The Rev. Mr. JAGO, who has been recently appointed by the London Diocesan Home Mission to labour in the district of "the Brill," Somer's Town, delivered a very animated and affectionate address on the blessings which an attention to religious matters was sure to bring in its train. He very earnestly warned his hearers against the sophistries of Infidel lecturers and teachers, and the practice of sabbath breaking so common in the metropolis. He quoted the testimonies of the chaplains of Newgate, and Clerkenwell gaols, to prove that a large proportion of the crime which came before the tribunals of the country, owed its origin to the systematic breaking of the fourth commandment. He believed that the religious training of our fellow-men, was the best safeguard of our land, and that with an open Bible, and a truth-loving population, England need fear no enemies.

Mr. JOSEPH PAYNE, deputy-judge of the Middlesex sessions, compared the leaders in the movement which had led to the present gathering, to so many lamps, and of them he said, they bore their heavenly Maker's stamp; they burned and shone in spite of damp; they showed alike plain roof and steeple, and they lit the path of all the people. Referring to the obstacles in the way of working men, and the temptations to which they were exposed, he expressed his concurrence in the remark that the neglect of the sabbath was one fruitful source of the crime which filled our gaols; and to this, he said, might be added intemperance. But for these evils, policemen and judges would have little to do. He closed an interesting address by reciting, as usual with him, a few verses extemporized for the occasion.

Mr. SAWELL referred to the statements made by Mr. Roebuck, in his recent speech at Salisbury, as to the degraded moral condition and the social discomfort of numbers of the working men in the north of England, whose earnings, he said, were nevertheless equal, if not greater, than those of some professional men. It was to be feared that the same remark was applicable to a portion at least of their brethren in the metropolis. They needed the influence of religion to raise them above that state of sensuality and selfishness which found its highest gratification in the public-house. The speaker pointed out and replied to many of the objections urged by working men against religion, and assured his hearers that its attainment would be found by them their best possession.

A STOKER, in the body of the meeting said, he and many others had attended with an earnest desire to profit by what they might hear, and therefore he wished to ask a practical question. He was quite aware that the whole of the work of a gas company could not be suspended on Sundays; but, he thought it might be materially curtailed. He was anxious, if it were possible, to be relieved of a portion of labour on that day, and he would feel grateful to those who had considered the subject, if they would point out how it could be brought about. He alluded to the case of the minister in the neighbourhood of London, who had had a tank erected at the back of his church, into which the gas required for the Sunday services was delivered the day previously. Another gentleman, in his anxiety to aid the workpeople in getting one day's relief from toil in the week, had decided not to burn gas at all on Sunday.

The CHAIRMAN thanked the speaker for drawing attention to the subject, and said he thought that a respectful petition to the directors of gas companies would probably lead to the engagement of a relay, so that the men engaged during the week might get the much-needed rest on Sunday.

Mr. PAYNE said he had taken a great interest in this question; and, in reference to the police of the City of London, he had succeeded in getting some relief for them. Of course, the streets could not be left unprotected or unlighted on Sunday; but the work of those who were necessarily engaged on that day should be made as light as possible.

Mr. CATLIN said a movement had commenced in Scotland for the express purpose of reducing the hours of labour in gas-works on the sabbath. The clergy, aided by some of the wealthy and influential inhabitants there, were now agitating the question, and he hoped they would bring it to a successful issue. The movement would, no doubt, extend to the metropolis, and he was prepared to show, at the proper time, that there was no real necessity for the greater portion of the work now done in gas-works on Sunday.

Mr. GAVIN KIRKHAM, Mr. SEWELL, Mr. KEYES, a gas-inspector, and others, subsequently addressed the meeting, which was kept up to a late hour. Several appropriate hymns were sung in the course of the evening, and the audience appeared to take a deep interest in the whole proceedings.

DR. J. NORTHCOTE VINEN'S REPORT ON THE GAS SUPPLIED BY THE SURREY CONSUMERS COMPANY:—

1862. Week ending.	Number of Observations.	Maximum Light. Candles.	Minimum Light. Candles.	Average Light. Candles.
Jan. 11	4	13·65	12·34	13·06
„ 25	4	13·61	12·30	12·75
Feb. 1	4	13·67	12·77	13·39

The volume of hydrocarbons averaged 4·26 per cent.; carbonic acid, 0·50 per cent.; there was no evidence either of sulphuretted hydrogen or of ammonia. No reference was made in this report to the pressure, it being proposed that some alteration should be made in the pressure-register. Upon the report being read at the last meeting of the St. Olave's District Board of Works, Mr. Walker alluded to the last clause in the report, and remarked that the gas company was willing to aid the board in obtaining the best possible means for testing the gas, and was anxious that the apparatus should be well supplied with gas. The company's engineer, Mr. Finlay, had set himself to work to find out how it was that Dr. Vinen and he differed so much as to the amount of pressure. They had come to the conclusion that there was something wrong either with the machinery or with the communication with the testing-room, but he believed the latter to be the case. The gas tested away from the room always indicated a higher pressure than in the room. Mr. Finlay thought one of the communication-pipes had become corroded, and he had offered to lay down a new main. He (the speaker) only wanted what was fair. A communication should be sent to Rotherhithe as to the necessity for this defect being found out and remedied. Mr. Finlay also thought the argand burner used was not a proper one, and that another should be used instead. The chemical examiner, however, would state the matter more in detail. —Dr. Vinen then stated that Mr Finlay was dissatisfied with the discrepancies between the register of the pressure at the works and at the testing-room. He had been down to the works, and there the register indicated the pressure as being double what it was at the room. He tested it again last Saturday, with a like result. The main was tapped outside the vestry-hall, and also at the top of the street, and in each instance the pressure was the same as at the works. Something was evidently wrong either with the machinery or with the communication therewith, it being most probable that the supply-pipe was too small. The main supplying the room was an old Phœnix main, and supplied also 136 other places. Mr. Finlay proposed to lay down, at the company's expense, a new main from the Free School Street main, and to connect it by a fresh pipe with the testing apparatus, putting up also a pressure-gauge. He also objected to the burner now used, saying that it was of the most oldfashioned and obsolete kind, the holes being too small to allow the gas to be tested fairly. Dr. Letheby thought the holes were two small to be fair to the company, and stated that he used an argand burner with larger holes. Dr. Thomson also used a similar burner. Mr. Finlay wanted Sugg's burner used, though he did not use it. This burner was a modification of the ordinary argand burner, by which the illuminating power of gas was increased without there being any larger supply. Mr. Shand asked if the testing-house was in the best place. Dr. Vinen replied that the site was bad both for the works and the health of the officer. He had seen the Stepney and Hackney testing-houses, and, though they were thought not suited for the purpose, yet they were palaces compared with the room under the vestry-hall. Mr. Walker moved that the board agree with the proposed alterations as to the supply-pipes of the testing-room, and that Rotherhithe vestry be communicated with, to ascertain whether they would concur in the execution of the work. Mr. Shand seconded.—Carried. Mr. Walker moved, and it was seconded and resolved that, in future, an argand burner with larger holes be used for testing the gas. Dr. Vinen, in reply to questions put by Mr. Wainwright, said the vault was so damp that the machinery soon got out of order. Mr. Walker alluded to the difficulty that was experienced in finding a place suitable for the purposes of a testing-room. This was evidently not the best place for the purpose, but they should be careful before they made any change. After some discussion, it was referred to the medical officer and surveyor, to consider and report as to what was requisite to render the testing-room better fitted for the purposes to which it was devoted.

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Several Gentlemen who are interested in the manufacture and supply of Gas, consider it desirable that an opportunity should be offered to those who know and appreciate the important services of the late Mr. CLEGG, of doing honour to his memory, and of marking their esteem and their recognition of the benefits he conferred on the public during his long life, by subscribing towards a Fund for the purchase of an Annuity for his Widow and Family, or for making such other provision as may be resolved upon by the majority of the votes represented at a Special Meeting of the Subscribers called to determine upon the manner in which the Fund raised shall be employed.

Mr. CLEGG has been called "the Father of Gas Lighting;" and, though that honour has been claimed for Mr. Murdoch and for Mr. Winsor, who first applied Gas to the lighting of the public streets, it was chiefly owing to Mr. CLEGG's efforts, and to his improvements in the earliest stages of its introduction, that it became successfully established.

To recall to mind some of the many advantages derived from the skill and energy of Mr. CLEGG to the Gas World, it may be stated: He discovered and applied, in 1806, the means of *Purifying Coal-Gas*, which he effected by the use of lime—the best agent yet known for the purpose. He applied the *Hydraulic Main* in 1811, which has since been generally adopted. In 1815, he invented the *Governor;* and, in the same year, he invented the first *Gas-Meter*. Though these are amongst the most important separate results of Mr. CLEGG's inventive genius, as applied to the improvement of Gas Lighting, it may be stated that it was by his skilful and energetic superintendence of the Chartered Company, that Gas Lighting was successfully introduced to London.

It is as the INVENTOR OF THE GAS-METER that Mr. CLEGG has been of the most essential service, and is, perhaps, best known to the world. This most valuable instrument, it may be said, for ingenuity and originality has not been surpassed since the invention of the Watch, and this invention alone will perpetuate his name, and distinguish Mr. CLEGG as one of the most original inventors of our times. Although the discovery of the Meter has proved to be of immense value to all Gas Companies, a long time elapsed before they could be induced to use it; consequently, Mr. CLEGG derived but little advantage from what has so essentially contributed to the general adoption of Gas Lighting. The last four years of his life were exclusively devoted to the invention of a Meter, entirely new both in principle and construction; but he did not live to derive any benefit from it, and the large outlay necessary to bring it to perfection greatly diminished his pecuniary resources.

An engineering concern in which he became a partner was unsuccessful in 1827, and, though legally exonerated from responsibility, he, in the latter years of his life, paid the balance due to his creditors. This is an instance of the highly honourable character of the man, though by that sacrifice he was prevented from making provision for those who mourn his loss.

In a short Memoir, published at the time of Mr. CLEGG's death, it was justly observed—"The memory of the Father of Gas Lighting will be cherished as long as ingenuity, skill, energy, truth, and rectitude are valued among men." And the same Journal which recorded his merits when dead, thus spoke, some years previously, of the neglect he experienced when alive. "The Patriarch of our profession is still a living monument of unrewarded genius." SAMUEL CLEGG went to the grave unrewarded, in the eightieth year of his age, but his Widow and Family survive, and it is not too late to honour his memory by a Testimonial of gratitude for his eminent services as a Gas Engineer, and of respect and admiration for his conduct as a man.

Subscriptions may be paid to the account of the Trustees of the "Clegg Annuity Fund," at the London and County Bank, Lombard Street; and Mr. Thomas G. Barlow, of 42, Parliament Street, Westminster, has kindly consented to receive, on behalf of the Trustees, all letters or other communications relative to the proposed Subscription.

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I am, dear Sirs, your obedient servant,
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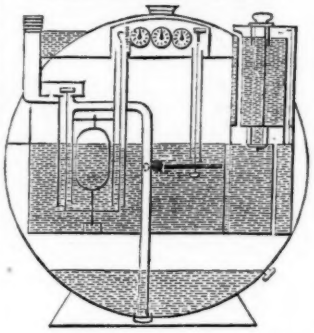

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CONSULTING GAS ENGINEER,

Inventor and Patentee

OF

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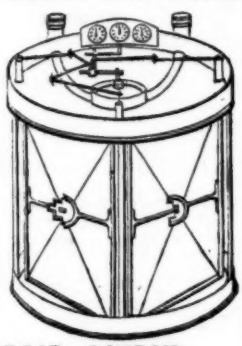

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To remove any doubt of accuracy of measurement his Meter for 1500 lights, in use upwards of ten years at the Royal Italian Opera, until that Building was destroyed by Fire, was long afterwards dug out of the burnt ruins, then tested by the Chartered Gas Company in the presence of George Lowe, Esq., F.R.S., and other Chief Officers, and found inflexibly correct. Also, on the 9th of June, 1858, at the Western Gas-Works, his Meter for 150 lights, after considerable use, was doubted, and subjected to the most variable tests—from the full lighting to a single Jet—and in each case, as in other instances, accuracy was finely indicated.

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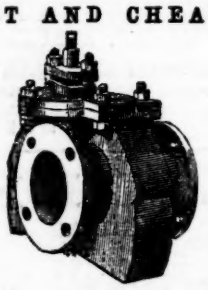

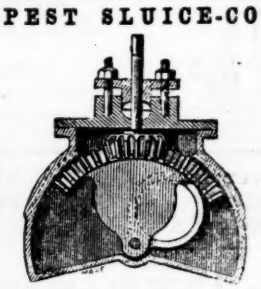

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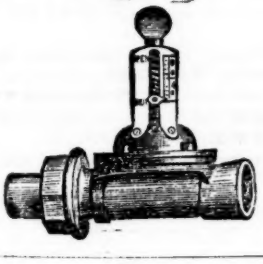

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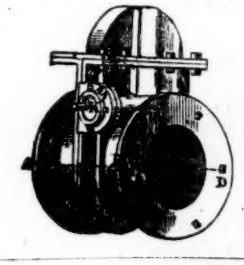

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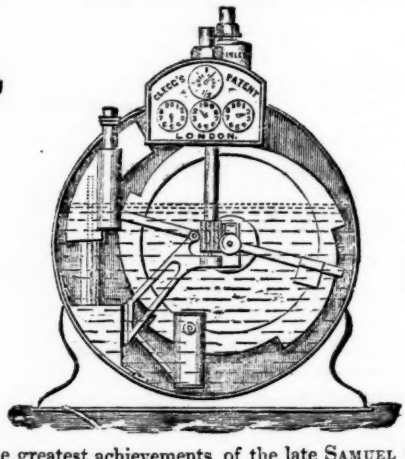

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